# THE TEXTILE MANUFACTURER

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# *Notes of the Month*

## U.K./HONG KONG TEXTILE PACT

THE voluntary undertaking given by the Hong Kong Textile Negotiating Committee on the limitation of its exports of cloth goods to this country does little to improve the immediate position in Lancashire manufacturing circles but it is to be welcomed as a sincere, although very protracted, effort to solve at least one of the major factors affecting an industry still providing direct employment for over a quarter of a million people. Under the undertaking —for a three-year period which commenced February 1, total exports of grey cloth for retention in this country shall not exceed 115 million sq. yds. a year.

The undertaking which the Hong Kong cotton industry is willing to impose on itself for the next three years reads as follows:—

(1) This undertaking shall not apply to the following: cotton yarns and threads, articles manufactured from cloth of U.K. origin, sacks and bags, stockings and socks, knitted underwear, knitted outerwear, fabric gloves, knitted gloves, plimsolls and canvas shoes, any other manufactures of cotton which the Hong Kong government may specify as not properly coming within the scope of this undertaking.

(2) Exports of cotton piece goods to the U.K. for retention there shall not exceed a ceiling figure of 115 million sq. yds. in each year, for a period of three years only, from a date in 1959 to be appointed by the Hong Kong government subject to the provisions of paragraphs 6, 7, 8 and 9 below.

(3) If the ceiling figure is not reached in any particular year the shortfall shall be carried forward for use within the first six months of the succeeding year.

(4) There shall be in each year an additional ceiling of 3 million sq. yds. to be applied specifically to yarn-dyed cloth and towelling exported in excess of 4 million sq. yds. If this additional ceiling is not reached in any particular year the shortfall shall not (repeat not) be carried forward, but shall lapse and shall not be made available for any other type of cloth.

(5) There shall be no limit on exports of made-up cotton manufactures.

(6) For the purposes of this undertaking estimates shall be made from time to time of the cloth equivalent of the made-up cotton manufactures (other than those specified in paragraph 1 above) exported to the U.K. for retention there. The method of calculating the cloth equivalent of made-up cotton textile manufactures shall be as agreed between the Hong Kong government and the U.K. Board of Trade.

(7) A calculation shall be made of the cloth equivalent of the made-up cotton textile manufactures (other than those specified in paragraph 1 above) exported to the U.K. for retention there during the twelve months ending three months prior to the coming into force of this undertaking. For the purposes of this undertaking this quantity shall be called X million sq. yds., and shall be not less than 46 million sq. yds.

(8) The ceiling set down in paragraph 2 above shall be reduced or increased for the second year of the undertaking by the amount by which the cloth equivalent of the made-up cotton textile manufactures (other than those specified in paragraph 1 above) exported to the U.K. for retention during the first twelve months of the undertaking exceeds or falls short of X million sq. yds. The ceiling for the third year of the undertaking shall be adjusted in accordance with the same formula. In the event of the ceiling thereby approaching zero the Hong Kong industry and the Cotton Board will request their respective Governments to consult together.

(9) This undertaking shall not apply to cotton textiles, whether in the piece or made-up, which are imported into the U.K. for re-export, with or without processing there. If it is established to the satisfaction of the Hong Kong government, after consultation with the U.K. Board of Trade, that cotton textiles exported to the U.K. under the provisions of paragraphs 2 - 8 above for retention there have subsequently been re-exported, a further amount equal to the quantity so re-exported shall be added back to the appropriate ceiling.

(10) The Hong Kong government shall be solely responsible for the legal and administrative arrangements necessary for the proper carrying out of this undertaking, and may request the U.K. Board of Trade to put into force any ancillary arrangements in the U.K. which it may deem necessary.

(11) This voluntary undertaking is not conditional on similar undertakings being given by other Commonwealth countries.

(12) If, during the currency of this undertaking, there should occur any major changes other than the changes envisaged in paragraph 8 above, or changes in the proportions of loom-state and finished cloth in the pattern of the U.K. import trade in cotton textiles to the detriment of either the Hong Kong industry or the U.K. industry, there shall be further consultations at the request of either industry to consider whether any consequential modifications to this undertaking are necessary.

(13) The Committee reserves to itself the right to withdraw this undertaking should the Hong Kong government at any time decide that economic conditions in the Colony have deteriorated to such an extent as to justify its withdrawal in the general interests of the Colony.

Lord Rochdale, chairman of the Cotton Board, who led the Lancashire mission to Hong Kong last September, said he was very pleased that some agreement had been secured, although he recognised that the industry in Lancashire

would have preferred lower figures than had been achieved. He now hoped that the Indian and Pakistan cotton industries would ratify the agreement on similar lines reached in principle last year. If this could be carried through it should bring stability to the home industry and enable traders to turn away from this problem to concentrate on other equally important matters such as re-equipment and reorganisation of the structure of the industry. The rapid increase of duty-free imports had been sufficient to put off any reinvestment in the industry, he added. Questioned as to why cotton yarn had been excluded from the undertaking, Lord Rochdale said that in India, Pakistan and Hong Kong the negotiators had tried to get cotton yarn included but had not been successful. Although he sympathised with the attitude of the spinners he believed the agreement as it stood should be helpful to the spinning industry and it would mean a definite limitation on arrivals of cloth and made-up goods. He pointed out that the annual rate of cotton yarn imports into the U.K. from Hong Kong was equivalent to about one-third of one week's production of yarn in Lancashire.

Sir Cuthbert Clegg, a member of the Lancashire mission to Hong Kong, and vice-president of the Cotton Manufacturers' Association, said it had been imperative to get the arrangement fixed up in order to restore confidence in the Lancashire cotton industry. "It should have an important psychological effect both on the industry here and also on textile industries abroad," he claimed.

During the past few months much criticism has been heard of the time taken to reach agreement on these important matters. Many have forgotten that Hong Kong has to contend with formidable economic difficulties and in agreeing to this voluntary undertaking has nothing to gain directly. It is, however, a gesture which forcibly emphasises that satisfaction and progress can be made by people determined to get to grips with a desperate situation rather than resort to vicious panic measures as a palliative.

## YARN PRICE AGREEMENT MUST END

In its first judgment on a price-fixing agreement, the Restrictive Practices Court in London recently declared as "not in the public interest" the agreement operated by the Yarn Spinners Association in Lancashire fixing minimum prices. The Court was satisfied that the price of yarn could be lower than it was, and the president, Mr. Justice Devlin, explained that the Court had given especially careful and anxious consideration to the effect of its judgment at a time when unemployment had been rising. But, he maintained, if competition among spinners had been free over the past six years since activity had started to decline, excess capacity might have been eliminated without serious disturbance to the labour market. The agreement had held back the outflow from the industry. It was inevitable, declared the president, that when the dam was breached the flow should be greater than the normal flow.

He continued: "We are satisfied that the industry can and ought to be made smaller and more compact. We think it is inevitable that in the near future a number of mills will have to close down. Subject to the initial dislocation we see no reason to believe the industry will be left without sufficient capacity to meet all ordinary demands of the home market and to maintain and increase its share of the export market. We have come to the conclusion the advantages to the public of cheaper and better goods by a modernisation scheme are not substantial and therefore cannot be brought into reality."

Mr. Justice Devlin pointed out that the minimum price was an artificial figure calculated on a hypothetical average cost. In theory it was designed to tide spinners over their periods of recession. The fact was that most of the time the majority of the spinners had been operating on the minimum price which had become the fixed price. "The scheme is designed to guard against cut-throat competition such as in the great slump of 1929-31 and a recurrence of which is feared by all sections of the industry. We are satisfied there is a considerable amount of excess capacity in the industry. Since 1952, the spindle capacity had been running on the average only to the extent of about 70%. In 1956-7 in the U.K. 2,100 hours were worked per spindle per annum. In Hong Kong the corresponding figure was 8,100; in the U.S. 6,100; in India 5,900; in Japan 4,900; and in Germany 4,000. We are satisfied that this excess capacity will not in the forseeable future be eliminated unless the scheme goes."

Mr. Justice Devlin also said that if the scheme went, "It would not necessarily diminish competition. We think that any scheme which imposes a minimum price contributes to price stability. There are a few cases where price stability benefits the public but this is not one. We find that price stabilisation confers no benefit on the public here which is not to be found in free competition." The Court were satisfied that considerable export business had been lost—not so much in yarn as in goods—from the rigidity of the scheme, and the refusal of the spinners to make even the smallest concession. It had been decided that it would be unreasonable to continue the restrictions of the scheme and they found the association had not made out a case.

The industry received the decision of the Restrictive Practices Court with mixed feelings and the judgment has been sharply criticised by representatives of both the employers and unions. Nothing can alter the fact, however, that restrictive practice in any shape or form is wrong fundamentally. Similarly, one cannot dispute the statement that the industry is working far below capacity. It is also true that many firms have continued to pay good dividends from profits made whilst only partially employed and this alone is probably the biggest single factor operating against the attainment of maximum efficiency in plant, machinery and operatives. It is unfortunate that the findings of this investigation should appear in the middle of a recession and it will undoubtedly result in the closing of more spinning mills but it is better to face these problems now that the atmosphere has been cleared rather than tolerate indefinitely the chaotic conditions of the past few years.

It is quite impossible to over emphasise the importance of the Court's declaration and its possible impact upon those sections of British industry still hedging themselves with price arrangements which protect both the weak and less efficient units from the otherwise inevitable effects of their inefficiency. Terms of reference necessarily define the extent of any investigation and now that judgment has been delivered on the Yarn Spinners' case the utmost efforts should be directed to breaking down other undesirable factors detrimental to lower prices and increased turnover to the consumer and consequent higher production of yarn, cloth and goods. A start has now been made in the producing side of what is still a vitally important industry. Is it too much to hope for that the merchanting, wholesaling and retailing activities should be the subjects of similar inquiries? British industry, in general, has laboured far too long under the yoke of price rings, restrictive practices, monopolies, and petty officialdom.

# Oil Burners for Mill Boiler Plant—2

*Automatic controls for oil-firing equipment save fuel but although automatic plant may require less attention than a hand-controlled installation, the attention must be of a more highly skilled order.*

By F. H. SLADE, A.M.I.MECH.E.

PROCESS work involved in the textile industry generally requires a fairly high draw-off of steam at varying times of the day. The fluctuating load thus indicated may be met by the installation of plant of large storage capacity such as is given by Lancashire or big Economic boilers. In the smaller mills, a vertical boiler might cater for the demand. A boiler plant falling within the first mentioned category is illustrated in Fig. 10. It comprises a two Lancashire boiler installation giving about 20,000 lbs. of steam per hour.

The burners firing these boilers are Laidlaw Drew "ATM" type equipments, in which oil is supplied under a small head and is atomised by steam jet. The fuel used is coal tar 200 (creosote pitch mixture) and the installation is hand controlled. The burners provide for use of both steam or air for atomisation, whilst the nozzles ("AT" type) embodied in the design were primarily developed for the combustion of liquid pitch and are intended for use with all heavy grades of tar fuel.

Each nozzle consists of two parts; the choke and the swirler. The conical surface of the swirler is grooved and the spaces thus formed between the swirler and the choke provide passages for the atomising medium. On the cross-sectional area of these passages depends the amount of atomising medium passed, and the directional component of these grooves taken in conjunction with the shape of the exit orifice of the choke controls the shape of flame produced. The fuel passes through the centre of the swirler, spins within the vortex cup and stream of atomising air (or steam) at the periphery, where it is broken up into small droplets and is mixed with the atomising medium when passing through the mouth of the choke.

The three large Economic boilers shown in Fig. 11, each producing 17,000 lbs. of steam per hour, are fired by Laidlaw Drew "ALM" type medium pressure air burners fitted with fully automatic modulating flame controls which give a constant oil/air ratio over the full boiler range. The burners used here may be blown on either compressed air or steam and are normally fitted with an "A" type nozzle; suitable for all grades of petroleum fuel oil. Both "A" and "AT" type nozzles of the same capacity are, however, interchangeable and therefore fit either "ATM" or "ALM" burners.

Each "A" type nozzle consists of three parts; the choke, swirler and film screw. The surface of the swirler is grooved and the helical space that is formed between the swirler and choke provides passages for the atomising medium. As with the type "AT" nozzles, the amount of atomising medium passed is determined by the cross-sectional area of these passages, whilst the pitch of the helix in conjunction with the shape of exit orifice control the shape of the flame produced. The film screw has a hollow stem, through which the oil passes and thence radially between the underside of the head of the film screw and the head of the swirler. Atomisation takes place at the periphery of the film screw. Although there are no small jets through which the air has to pass, it is claimed that the atomisation given by this arrangement is so fine that the resulting mist will remain in suspension for a considerable period.

The valves fitted to the burners are of the rotary type in which a groove of progressively increasing depth is cut round the periphery of the tapered plug. This design gives accurate control and freedom from fading even when working at very small capacity and when controlling the heaviest grades of fuel. For air jetting, a pressure of from 20 to 25 lbs./in.$^2$, supplied from a single stage compressor, is recommended. Where no extraneous source of power is available

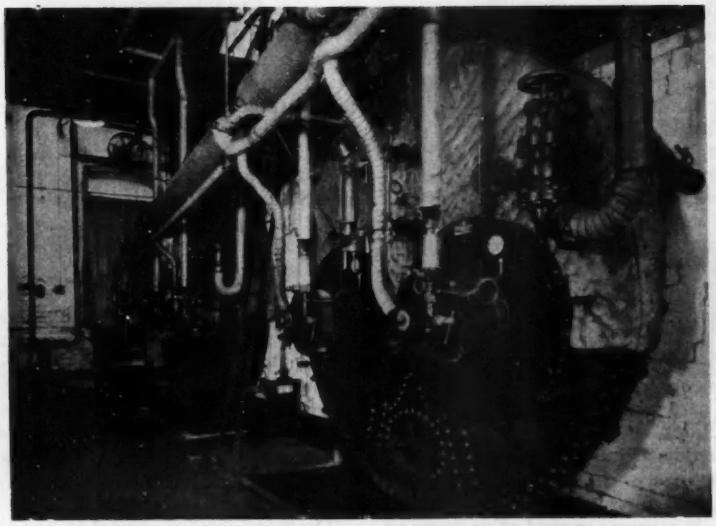


**Fig. 10. Lancashire boiler installation comprising two units giving a total steam output of about 2,000 lbs./hr. fired by Laidlaw Drew "A.T.M." type steam jet burner. Coal tar fuel 200 (creosote pitch mixture) is used**

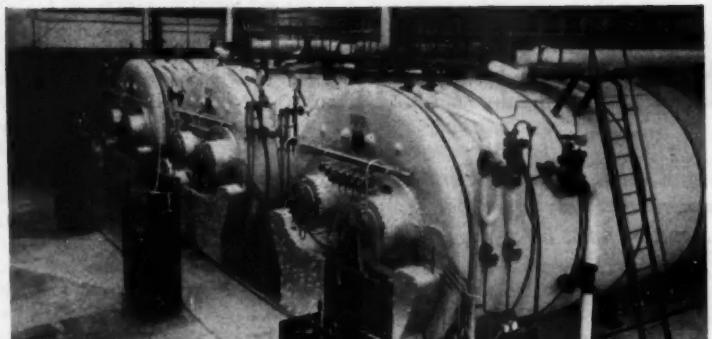


**Fig. 11. The burners firing these Economic boilers are of the medium pressure air type, fitted with fully automatic modulating flame controls which give a constant oil/air ratio over the full boiler range**

the steam jet system, at an atomising pressure of from 20 to 35 lbs./in.², is the most practicable, and in all cases it provides a simple and effective method of firing. On account of the high atomising pressure and on account of the temperature itself, it is particularly suitable for burning the heaviest grades of oil, and this without the necessity of pre-heating the fuel to the same degree as is necessary with either the low pressure air or pressure jet systems.

As already stated, firing of the boiler shown in Figure 10 is hand controlled, whilst that illustrated in Figure 11 is equipped with modulating control. Primarily, the object of automatic controls for oil firing equipment is to save fuel rather than to save labour. It should also be realised that while an automatic plant may require less attention than a hand controlled installation, this attention must be of the more highly skilled order. To obtain this desired fuel economy the first essential is that under all working conditions a constant fuel/air ratio should be maintained. In most cases the accuracy of pressure or temperature maintenance is a secondary consideration.

There are, however, two distinct functions, each of which must be treated separately. These are (*a*) maintenance of a constant fuel/air ratio for minimum fuel consumption and (*b*) accurate control of pressure or temperature to suit factory working conditions. It is thus desirable, when considering automatic control, to decide which of these functions is the more important, i.e. whether it is more economical to aim for a low fuel consumption on the plant which is being fired, or to make economic the process for which the heat is being used by close pressure or temperature control. Both may, of course, be necessary, but it should be noted that if control is specified to finer limits than are really essential, the cost of the control equipment must also be higher than is necessary.

### Control Systems

Three systems of control are in use with Laidlaw Drew oil burners, these being on-off, high-low flame and modulating control. The former method is recommended for firing small boilers only. In the case of high-low flame control, the fuel and air valves (or dampers) are arranged so that the correct fuel/air ratio is obtained both in the high flame and low flame positions. Such controls are easily set, but as they do not necessarily give accurate fuel/air ratios at intermediate positions, their ultimate efficiency depends upon infrequent movements from high to low and from low to high flame positions. Furthermore, if these movements are not to take place too frequently some latitude in the temperature or pressure under control is essential.

The best type of control is one in which the fuel input is variable and is adjusted automatically to suit the rate of heat take-off. Such control is kinder to the plant being fired than is either the on-off or high-flame type and can give more stable temperature or pressure conditions. With the exception of the Type VAS control, which can be used with a fuel supply under gravity or under a small pressure, all Laidlaw Drew modulating systems incorporate a differential pressure spill-jet to obtain reference pressures which are related to the instantaneous rate of fuel flow, and these reference pressures are applied to adjust the supply of combustion air either directly or by means of a servo motor. These controls are, however, partly inferential in that they adjust the air valve or damper in accordance with a fuel flow measurement.

In the VDB system, fitted to the John Thompson Wilson twin-flue Economic boilers illustrated in Fig. 11, both air flow and oil flow are measured and then co-related. All VD systems comprise two basic components; a differential spill jet and a fuel return pressure group. The former, as indicated, provides both a means of measuring the rate of fuel flow to the burner and rendering this flow controllable, whilst the control of the fuel output by the spill jet to the burner is governed by the fuel return pressure control group. A six-way valve chest provides a means of setting the maximum and minimum burner output, of controlling the burner manually, and of isolating the automatic pressure control valve and other automatic features.

As the VDB system effects control through the measurement of both fuel and air, it provides a more accurate fuel/air ratio than is otherwise possible. The air/fuel ratio is co-related by means of a law plate, embodied in the draught balancer panels shown in the foreground of Fig. 11, which is individual to each installation and which once cut will maintain the air/fuel ratio without further adjustment. Where a number of burners are in use in a single boiler the fuel/air ratio is not upset by shutting off one or more burners.

The oil firing of a vertical boiler is exemplified by the installation illustrated in Fig. 12. It shows a plant of about 6,000 lbs. of steam per hour capacity fired by a Laidlaw Drew "PH" type fully automatic modulating flame burner with automatic stopping and relighting. The burner is a self-contained unit and combines all the fuel components together with a forced draught fan. The fuel pump and fan are driven in tandem by an electric

motor, and control is by an automatic pressure valve which regulates the fuel return pressure. This, in turn, controls the output of the jet. The return pressure also operates a hydraulic damper so that the correct oil/air ratio is maintained over the full working range.

With modulating flame control the flame is continuously lit and under a steady load the fuel output remains constant. Under variable load the rate of firing follows closely on any change in heat demand. An overriding stop and start feature is also provided so that on loads below minimum flame, or with a non-load condition, boiler steam pressure or water pressure is maintained by "on-off" working. Laidlaw Drew modulating flame pressure jet forced draught burners are made in a range of units suitable for firing vertical boilers of capacities ranging from 1,000 to 8,000 lbs. of steam per hour. For boilers up to 4,000 lbs. per hour single nozzle burners are suitable, but for over this capacity double nozzle units are employed.

### Heavier Oils

The increasing use of heavier grades of oil indicates that particular care must be taken in the design and installation of fuel handling equipment. Unit burners such as the "PH" type are provided with their own pumps and heaters, and have a built-in circulating system which automatically ensures that the oil is at the correct atomising temperature before the set is allowed to start-up. With large installations equipped with individual burners, it is also essential that the supply of fuel should be consistent; each burner should receive its supply of oil at a steady pressure and, where pre-heating is necessary, also at a steady temperature. It is also desirable, where burners are numerous, that these conditions should vary as little as possible from burner to burner.

Compliance with the foregoing is achieved by the use of Laidlaw Drew Simplex or Duplex pumping, heating and straining units. The former are only suitable for intermittent or stand-by use, but where oil firing becomes a continuous process it is necessary to have resort to a Duplex equipment, or, as shown in Figure 13, an equipment in which all components are duplicated so that any combination of pumps and heaters can be used.

These units draw the oil directly from the main fuel storage tank and circulate it around a ring main from which branch lines are taken to each burner. The system ensures that the oil is delivered to each burner at an even temperature and pressure. Constant pressure is maintained by means of a stabilizing valve. This feature is, of course, essential with present-day fuels; of viscosities of up to 4,000 sec. Redwood No. 1 at 100°F.

### Storage Tank Heaters

Another important consideration in connection with the supply of heavy grades of fuel oil is the fitting of properly designed heaters on the storage tank, such as the shrouded type outlet flow heater. Laidlaw Drew and Co. Ltd. were the original designers and manufacturers of this equipment for storage and service tanks; by the use of which it is not necessary to insulate the oil tank as they only heat the fuel leaving the tank and not the bulk of the fuel in the tank.

The heating unit consists of a shell which is partly immersed in the tank. This shell contains a heating element, either electrical or steam, or a combination of both, together with some form of thermostatic control; the thermostat being mounted towards the top of the shell when circumstances permit. The fuel off-take is taken from the body of the heater, and the shroud is so arranged that oil from the tank can only enter at the bottom of the shroud. It will thus be seen that any application of heat to the elements in the heater will take immediate effect on the outlet temperature of the fuel and that the temperature of the fuel leaving the tank is always under control.

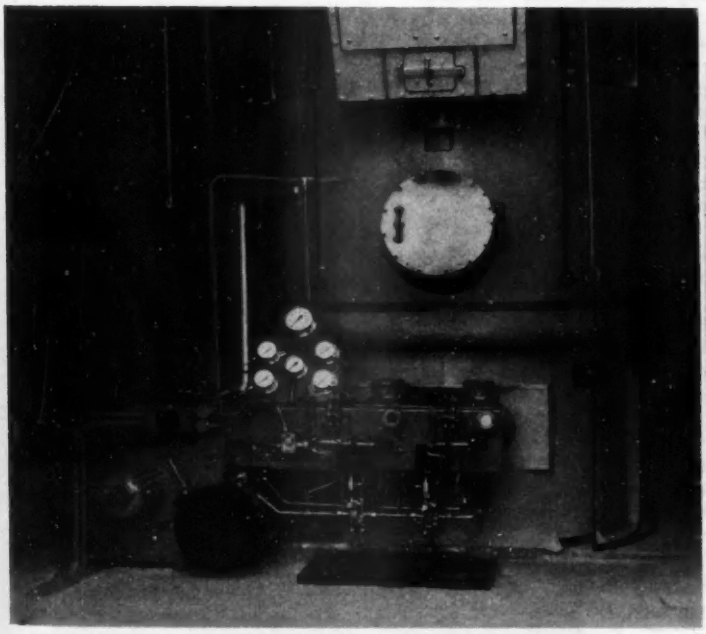


Fig. 12. The vertical boiler installation of about 6,000 lbs. steam/hr. is equipped with Laidlaw Drew pressure jet firing gear of the fully automatic modulating flame type

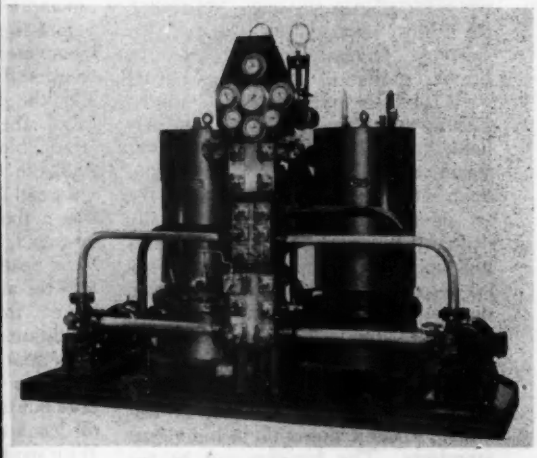


Fig. 13. Fully duplicated pumping, heating and straining units with electrically operated pumps and steam-operated oil-heaters. The valve cheats shown enable any combination of pumps, heaters and strainers to be used

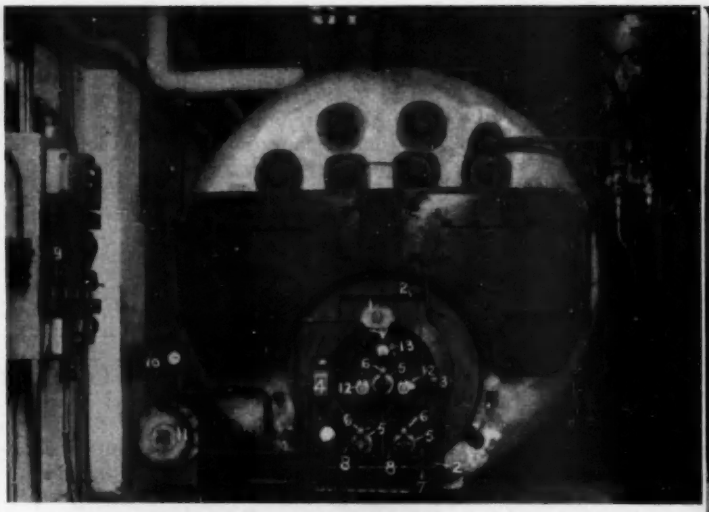


Fig. 14. Ruston Hornsby Thermax steam boiler, rated evaporation 5,000 lbs./hr., fitted with a fully automatic "Swirlmaster" equipment using 950 seconds fuel oil

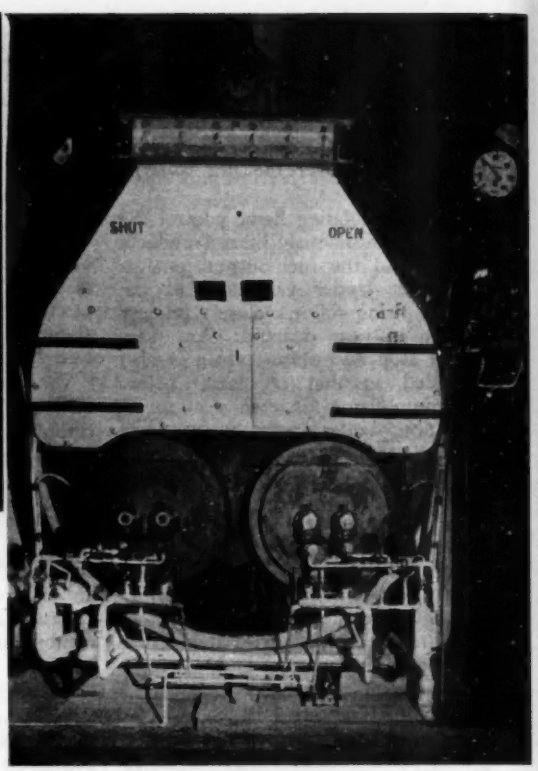



Fig. 15. "Swirlmaster" M.A.P. burners are also fitted to this 7,000 lbs./hr. Farrar tube boiler. A supply of air or steam at 15 lbs. pressure is required for this design of equipment and atomisation is achieved by passing the air or steam through a tangentially drilled brass swirl

### Improved Burners

Figs. 14 and 15 illustrate boiler plant installations fired by "Swirlmaster" oil burners. Made by Auto Combustions (London) Ltd., this system of oil firing incorporates a number of refinements providing improved efficiency and reliability, especially applied to the smaller capacity plants operating on the heavier grades of fuel. The burner itself is simple and efficient, having no moving parts to fail and no fine jets liable to choke. A supply of air or steam at 3-15 lbs. p.s.i. is required and atomisation is secured by passing the air or steam through a tangentially drilled brass swirl. When ignited this high speed swirling motion of atomised oil is maintained, so giving an even distribution of heat within the firebox.

Operation is on all grades of fuel oil, ranging from gas oil at 35 secs. viscosity (Redwood No. 1) to heavy bunker fuels at 6,000 seconds viscosity, without alteration to individual atomisers. The burners can be installed as hand-controlled, semi-automatic or fully automatic plant, to suit every application, whilst individual burners are available for capacities from half to 50 galls./hour, and for higher capacities by multiple atomiser assemblies. Several boilers can be operated from a single air compressor and/or oil heating and pumping unit, thereby reducing overall costs of installation.

The improvements now effected include a method of pre-circulation of the oil that ensures a supply at a point not more than 6 ins. from the burner, before ignition is attempted. This overcomes the previously often encountered trouble with "dead legs" and the resultant failure to "turn-over" the flue thermostat within a reasonable time. There are two available methods. One of these is for small compact installations and for this a fixed pre-circulation period is arranged, during which the circulating oil is heated to the requisite temperature for atomisation. The other is for larger installations or where site conditions make a long ring main unavoidable. Here a thermostatic device is used to ensure that ignition does not take place until the circulating oil has attained working temperature. With the latter systems, the line heater may be switched on and off with the plant, if it is not desired to keep the heater "on" all the time.

A further refinement is the incorporation of a special oil recirculating valve, by the use of which fluctuations in oil pressure, and consequent fluctuations in flame size, are almost completely eliminated. The new valve also overcomes the tendency for the high oil pressure and low pump output usually experienced when starting up from cold after a lengthy shut-down. When the pre-circulation period commences, the valve is fully open, allowing the pump to operate at maximum output and low pressure.

At the end of the pre-circulation period, the valve partially closes, bringing the ring main pressure up to normal. At the same time, the oil supply is fed to the burner and ignition is established. Ignition on 200 seconds installations is by a single pair of electrodes of a new and improved heavy pattern; a feature effecting considerable economy in initial cost without any loss of efficiency.

Fully automatic systems, incorporating "on-off" operation plus "high/low" flame together with "step-in start," are available. With this equipment the plant starts on the normal automatic "step-in" principle and then continues to run on the "high-low" flame principle whilst the boiler load is normal. When the load reduces below the rating of the low fire, the plant will automatically switch itself off until heat is called for again. It then switches itself on and

the cycle of operations is repeated. Secondary air, automatically controlled by means of a motorised shutter, may be provided if required, and is recommended where a high "turn-down" ratio is required, coupled with low fire efficiency.

The foregoing improvements are incorporated in the installation illustrated in Fig. 14; with the exception of the new electrodes, the ignition here being by gas pilot jet. Referring to the reproduced photographs, it will be seen that the enumerated features include (1) photo-electric flame failure device, (2) controlled secondary air dampers, (3) damper control motion, (4) electro-pneumatic control box, (5) diaphragm "cut-off" valves, (6) graduated oil metering valves, (7) main circulating control valve, (8) secondary circulating control valves, (9) main control panel, (10) gas eliminator, (11) line pre-heater, (12) main burners, and (13) pilot burner.

### Smokeless Operation

Fired by a fully automatic medium pressure air type burner, the "Steampacket" package boiler shown in Fig. 16 has a thermal efficiency of 80-83% (lagged) and, with a normal $CO_2$ content of 13·5% is smokeless and thus satisfies the Clean Air Act. In designing this plant, the makers Cradley Boiler Co. Ltd., have concentrated successfully on reduction of unequal stresses arising from rear tube plate temperature variation, a defect of some 3-pass Economic boilers. The boiler has two rear tube plates, one housing the second-pass tubes (lower) and the other housing the third-pass tubes (upper). It is, in effect, a semi-wetback. In operation the hot gases from the first pass, or combustion chamber, contact the first tubeplate on entry to the lower or second pass, whilst the cooler "leaving" gases contact the second rear tubeplate after traversing the third pass, i.e. on entering the smokebox leading to the chimney.

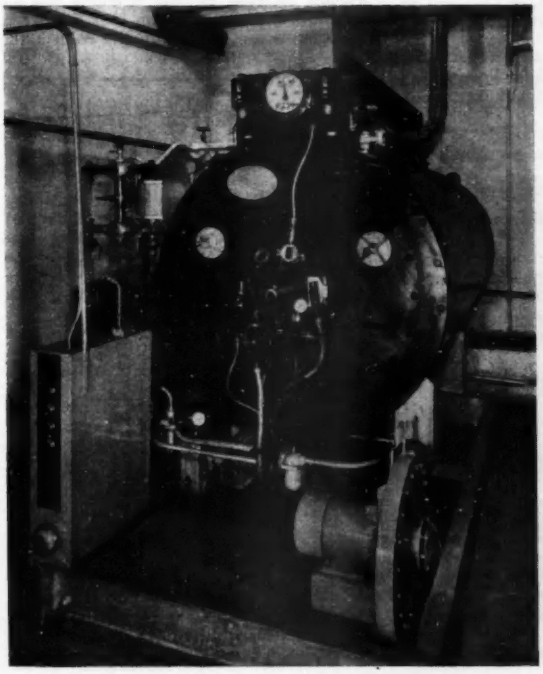
A part-riveted and part-welded construction has been adopted, whilst the first and second tubeplates are flanged to permit springing. Advantages claimed for this design are that (*a*) the risks which arise from different temperatures in one tubeplate are mainly avoided, (*b*) it has been found unnecessary to weld in the plain tubes which can thus be more easily replaced, or re-expanded, if required and (*c*) owing to its flanged and riveted construction and its two rear tubeplate design, enabling the boiler to breathe, the "Steampacket" is non-rigid; and steam can be raised from cold in not exceeding 35 to 40 mins. The result is a tough and lively boiler, responding well to fluctuating loads.

### Inspection, Cleaning Arrangements and Other Features

Fig. 17 shows the burner firing the plant. It is of the compound medium pressure air type with two-stage mixing and swirling of oil and air, is fitted with electric ignition and is fully automatic in operation; working on the "Hi-Lo-Off" principle. The flame is normally high, but automatically becomes low if the steam demand is reduced. Only if the demand for steam should be exceptionally small or cease altogether will the flame go off. Should this occur, it will be automatically relighted electrically as soon as steam is again required.

The burner can be removed for inspection and cleaning by unscrewing one wing nut, whilst similarly, by the turning of a cam lever, the electrode ignition assembly can be removed. Other features include a wide and flexible turn-down range, thermostatic control ensuring that oil is not released to the burner until it attains ignition temperature and a special anti-shock device eliminating blow-back on lighting-up. The boiler is fully safeguarded by safety controls providing for low water cut-off, flame failure, draught failure, and high steam cut-off.

(*To be continued*)



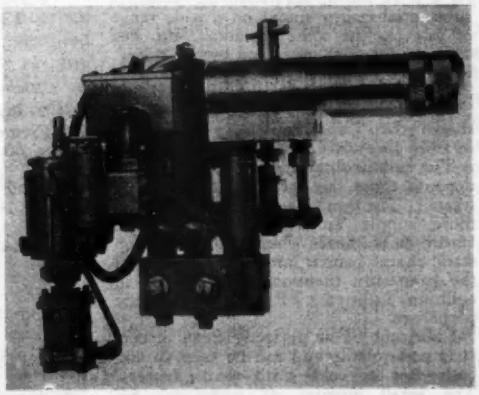


Fig. 17. This fully automatic, medium-pressure air type burner, incorporating two-stage mixing and swirling of oil and air, is fitted to the boiler shown in Fig. 16

Fig. 16. The efficiency of the "Steampacket" oil-fired package boiler is normal, 80 - 83% (lagged). Steam can be raised, in most sizes, from cold in 25 - 40 mins.

# New Agent Imparts Several Features to Cloths, etc.*

AN aqueous dispersion of polyethylene containing 25% solids, Lubricant SF is non-ionic in character and is readily miscible with water in all proportions; such compositions may be raised to the boil without change. The product is compatible with a wide variety of products. Thus it is miscible with both anionic and cationic finishing agents, with thermosetting resins, dilute acids and resin catalysts such as acid salts, amine hydrochloride and polyvalent metal salts which are common additions to resin baths.

### What it Does

Lubricant SF enables high speed sewing machines to be used without the danger of breaking the yarn or filament. As a result, the seams will be stronger in cloths made of either natural or man-made fibres. Used as a pure finish it is claimed to increase the tear strength of most cloths, and is particularly effective on resin treated cottons. When Lubricant SF is added to the resin bath the tear strength of cottons can be increased by from 30% to 70%. As a pure finish, Lubricant SF causes a substantial improvement on a wide range of fabrics. In some instances, the flex abrasion figure as measured by the B.F.T. Mark III wear tester has been increased 3 - 5 times that of the untreated fabrics. Similar remarkable improvements are shown when Lubricant SF is incorporated in resin formulations.

The handle obtained with Lubricant SF depends upon the particular fabric to be treated. The trend is to a more mellow and more supple finish than the original. Hydrophobic fibres which readily develop static charge benefit not only in respect of the properties mentioned above but, in addition, Lubricant SF confers anti-static properties.

Lubricant SF is perfectly clean in use. It is non-volatile and can be used in any bath—hot or cold—with equal success. The small amount of Lubricant SF required makes it one of the most economical products on the market. Its all-round compatibility, stability and ease of dilution further reduce your process costs.

### How to Use It

*As a Pure Finish*—Filament rayons in particular, such as secondary acetate, triacetate or viscose rayon, are said to benefit particularly in stitching performance and tear strength by being padded in a bath containing from 3 to 10 grams of Lubricant SF per litre (3 lbs. to 10 lbs. per 100 galls.). The impregnation may be carried out in the cold. The product has no adverse effect on dyed or printed shades.

*In Resin Baths*—Use the product to give approximately 1% on the weight of the fabric. Usually this means that it needs to be used at 15 to 20 grams/litre of resin bath (15 lbs. to 20 lbs. per 100 galls.). The product is incorporated in the mix quite simply. The resin is first diluted with two-thirds the required amount of water, the lubricant may then be added without dilution. The catalyst should be dissolved separately before addition, and finally the bath is brought up to volume.

### Formulations

(1) *No-Iron Finish for Cottons Based on Urea-Formaldehyde Resin*
- 40 parts U.F. resin (30% solids content)
- 2 parts Lubricant SF
- 0·8 parts ammonium dihydrogen phosphate
- Bulk to 100 parts with water

(2) *Crease-Resistant Stabilised Finish for Cottons Based on Melamine-Formaldehyde Resin*
- 12 parts M.F. Resin (80% solids content)
- 2 parts Lubricant SF
- 3 parts crystalline magnesium chloride
- Bulk to 100 parts with water

(3) *Crease-Resistant Finish for Spun Viscose*
- 60 parts U.F. resin (30% solids content)
- 2 parts Lubricant SF
- 1·25 parts ammonium dihydrogen phosphate
- Bulk to 100 parts with water

### Examples of Effect

*Pure Finish*—A triacetate crepe was finished by padding in 10 grams/litre of Lubricant SF and then seam sewn with a No. 11 needle and secondly with a No. 14 needle. The breaking strength of the seam was then determined on a grab testing machine with the following results:—

| | Aver. breaking strength in lbs. | Change in strength after stitching |
|---|---|---|
| Untreated .. | 39 | — |
| No. 11 needle .. | 28 | — 28% |
| No. 14 needle .. | 24 | — 38% |
| Lubricated finish— | | |
| Unsewn .. | 38 | — |
| No. 11 needle | 37 | — 2·5% |
| No. 14 needle | 36 | — 5% |

The striking improvement brought about by Lubricant SF was not only evident from these figures but examination of the stitching showed much less damage.

A treated cotton poplin improved 36% in weft tear strength and in flex abrasion on the B.F.T. abrasion machine from 25,000 to 70,000 in the warp and from 4,200 to 4,700 in the weft. An acetate crepe (diacetate) improved 25% in tear strength and B.F.T. flex abrasion from 1,230 to 1,640 in the warp and 2,200 to 2,600 in the weft. The effect on a triacetate crepe was even more striking. Thus, the weft tear strength improved by 60% whilst the B.F.T. flex abrasion went up from 180 to 1,250 in the warp and 220 to 1,090 in the weft.

*With Resins*—A mercerised cotton poplin was impregnated with a urea formaldehyde resin with and without the addition of Lubricant SF to give 8% of the resin on the fabric and 1% of the lubricant. The so-treated fabrics were seam sewn across and weft with a No. 11 needle and a No. 14 needle and the strength of the seam at break measured. The weft tear strength was also determined by the Elmendorf method. The results were as follows:—

| Treatment | Change in Seam Strength |
|---|---|
| Resinated without lubricant, No. 11 needle .. .. | Loss 10·4% |
| Resinated without lubricant, No. 14 needle .. .. | Loss 20·8% |
| Resinated with lubricant, No. 11 needle .. .. | Loss 2·4% |
| Resinated with lubricant, No. 14 needle .. .. | Gain 2·0% |

The gain in tear strength on lubricated finish as compared with the unlubricated was 30%.

In another trial a mercerised cotton poplin was treated with a modified urea formaldehyde resin so as to give 4% of the resin on the weight of the fabric, in the one case with the addition of 1% of Lubricant SF on the weight of the fabric, and in the second case the lubricant was applied as a top softening to the fabric resinated without softener. Weft tear strengths as determined by the Elmendorf method were as follows:—

| | |
|---|---|
| Untreated fabric .. .. .. | 880 grams |
| Resinated with Lubricant SF .. | 880 grams |
| Resinated and top finished with Lubricant SF .. .. .. | 940 grams |

Top softening generally brings about a greater increase in tear strength and in abrasion, but such a finish is not as wash resistant as one applied in the resin bath.

* *Warwick Chemical (Yorkshire) Ltd., Ripley Road, Bradford* 4.

## *Dress and Coating Cloths*

**Arranged full size on the facing page are eight cloths from the range of distinctive high quality cloths manufactured by Cumberland Mills—a branch of Otterburn Mill Ltd.—Warwick Bridge, Carlisle. Brief details are as follows:—**

**(1) Squared double effect. Black and white loops on a white ground.**
**(2) Subdued knop effect in a shade of heather and white.**
**(3) Another squared effect obtained with crimson, bottle green and royal blue knop yarns.**
**(4) A lovely double-toned effect in fawn and white.**
**(5) A charming cloth in light green and grey effect yarns.**
**(6) All over peach coloured cloth with novelty surface loops.**
**(7) Brick coloured and gold knop yarns on a double-toned grey ground.**
**(8) Neat diamond effect in grey and white.**

# Electronic Slubcatchers for Winding, Etc., Operations

*These electronic units can be mounted on an assembly beam for fitting on the machine, or on special shockproof stands in front of the machine*

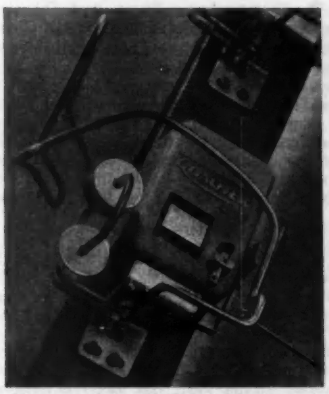
By J. GRINDROD

FOLLOWING many years of research and experimentation between a Dutch firm of electronic engineers, a Dutch textile mill and the Netherlands Fibres Research Institute (T.N.O.), a slub clearing device has been developed which operates electronically instead of requiring the yarn to pass through a narrow opening as is usual with most conventional mechanical devices. These electronic units, made by "Qualitex" N.V. Electronische Apparatenfabriek, Enschede, Holland, can be fitted to almost any type of winding machine and can be specially adapted to the design of the machine. They are mounted on an assembly beam to be fitted on to the winding machine or on special shockproof stands in front of the machine.

In designing the device it was intended to provide for the removal of all thick places during winding at normal speeds, the gauging head to average over a finite length of yarn and to make allowance for shorter defects, whose removal would only reduce winding efficiency without improving yarn quality to any marked degree. It was also intended that mass variations only, and not variations in colour, refractive index, etc., should determine the action of the device.

This latter requirement suggested the use of a measuring condenser, which would also be much cheaper than a photo-electric cell or mechanical or pneumatic types of instruments, and a new circuit with high amplification in volts per picofarad has now made this method possible. A slubcatcher based on this circuit has now been patented in a number of countries and patents are pending in others.

In the new device, the yarn passes through the measuring condenser without obstruction and is scanned 50,000,000 times a second at any winding speed. When a slub is detected, the cutting mechanism receives a signal in one-thousandth of a second, whereupon it cuts the yarn by means of a knife controlled by an electromagnet. The knife is located in an open frame where no dust can accumulate. The yarn also runs freely underneath the knife. The slub that is caught remains between the measuring condenser and the cutting mechanism so that the operator can see that the yarn contains a defect. After the thickening has been removed the knotting machine joins both ends of the yarn and the winding process is continued.

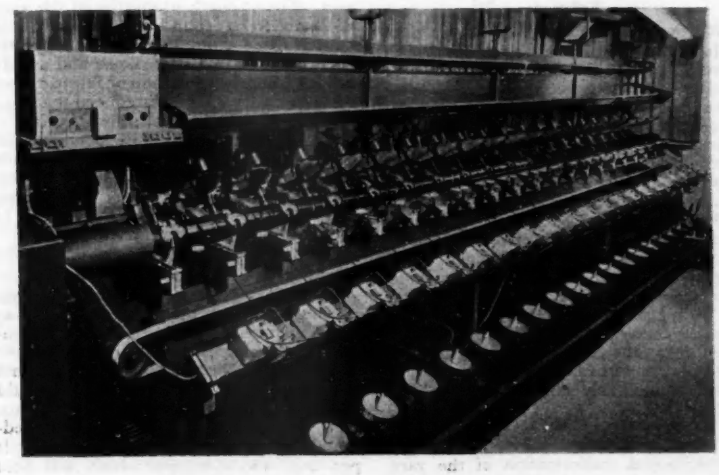


Close-up of the Dutch electronic slub catcher

So that the operator can select the gauge necessary according to the material used and quality requirements, the sensitivity of the measuring condenser is adjustable from a central point.

In order to protect the coarsest yarns from abrasion, the width of the measuring condenser must be 1 mm., while a breadth of 5 mm. is desirable to obtain a uniform electric field between the plates of the condenser so that slight displacements of the yarn will have no perceptible effect on sensitivity. The length of the gauging head was based on the staple length of cotton and was fixed at 30 mm. Tests have also shown that this length is also

(*continued on page* 62)



Dutch electronic units installed on winding machine

*Burnley Textile Society*

# Textured Yarns*

## *An outline of the operating techniques, the physical and other valuable properties and characteristics of some of the fabrics produced*

By G. HASTY†

TEXTURED yarns can be divided into two classes, (*a*) crimping on the thermoplastic fibres and (*b*) yarns bulked by mechanical malformation. Crimped yarns are the largest category in method by which the results can be achieved and, by volume, they are most suited to the field of knitted structures and, therefore, I propose to cover the methods used only briefly. They all depend on the ability of the thermoplastic fibres to take up the form in which it is set and to attempt to return to that form if free to do so.

### Crimped Crepe

Crimped crepe is made by twisting the yarn to a high twist, e.g., 30 den. to 90/100 turns, setting in hot water or steam and then removing the twist to give a high crimped and extensible yarn and, for most purposes, two ends of opposite twists are then folded together to give a balanced thread. This yarn has been extensively used for stockings, knitted underwear, swimwear and socks, etc. The process is expensive due to the operations involved and considerable research has been carried out into methods for doing the crimping at one operation by false twisting.

### False Twist

One of the most common methods employed is to use a high speed hollow spindle through which the yarn passes and this inserts false twist. Immediately before the spindle the yarn passes over a heater unit which sets in the high twist running back from the spindle, and the yarn, after passing through the spindle, has the twist removed again and is wound on to a package. This process has also given the spindle makers ample opportunity to show their skill and to achieve very high spindle speeds. In one case the spindle is the centre of a tiny electric motor and speeds of 125,000 r.p.m. are achieved.

### Bulky Nylon

Another modification which has come into prominence is the application of a second setting process to the yarn in its crimped form. The temperature is somewhat lower than the original crimping temperature and the yarn is treated in its semi-relaxed form which removes the elasticity and yet retains the high bulk and crimp. This is now finding application in the underwear, outerwear and other fields, where high fabric extensibility would be a disadvantage.

### Ban-Lon

A second method of producing crimped yarns is one using the stuffing box technique. High speed rollers deliver the yarn into a heated box which is restricted in its outlet and, consequently, the yarn is packed tight inside the box and the heat ensures the setting of it in this form and retention of the crimp when it is removed. A high bulk, elastic, non-torque yarn is produced which is finding applications in many fields such as underwear, outerwear, etc.

### "Agilon"

In this process the yarn is passed over a blunt razor blade at a sharp angle whilst under tension and in a heated state. This stretches one side of the filament relative to the other which is made permanent by the heat setting, and makes the yarn form into small curls similar to a spring.

In all these processes temperature controls are critical and a large part of the expenditure involved in the plant is due to maintaining running conditions from spindle to spindle, and temperature controls of the very high order of 1°-2° are obtained by this method. To obtain the best results, the fabrics made from these yarns must be given some form of wet processing and relaxation to develop their full bulk and crimp.

### Fabrics

In woven fabrics the yarn can be used to produce extensible fabrics and ones showing much greater fullness than is possible with the continuous filament parent and for abnormal shrinkage effects. To get the most from the yarn, it has to be given ample opportunity to contract and crimp and hence long float weaves, such as satins or honeycombs, give the best results. With crimped yarns in woven cloths, contractions from grey widths of 50 ins. to a finished relaxed width of 20 ins. or less are easily obtained. The general finishing technique used is to relax the fabric as fully as possible in a low temperature scour and then stretch it on the stenter to the final width required, according to the results desired, and there is ample opportunity at this stage to obtain innumerable effects.

### "Taslan"

This bulking process depends entirely on mechanical malformation of the yarn and heat setting is not necessary to give the bulking properties. Consequently, this process can be applied not only to the thermoplastic fibres such as nylon and "Terylene," but also to acetate, viscose, glass fibre and others. The "Taslan" process depends on air turbulence tumbling the individual filaments into loops and curls and then bringing them together again into the body of the yarn, and they are retained by means of friction of the surrounding fibres, and are bound in by twist in a similar way to the fibres of spun yarn. This loop formation will remain even up to the yarn's breaking point and is not materially changed during textile processing or fabric finishing. Whilst the degree of loop formation depends on the type of yarn used, in 70 den. nylon 34 filaments there may be as many as 70 or 80 loops/in. and the majority of these are within the body of the yarn, giving it is properties.

### Properties of "Taslan" Yarns

The properties of "Taslan" yarns and the fabrics produced from them can be influenced tremendously by the choice of the initial filament yarn from which they are made. Those made from very fine filaments give a softer loftier fabric with greater dullness, those made from the coarse filament deniers have a crisper, dryer handle and can become harsh with 5 or 10 den. per filament. In fact, due to loop formation, this tendency becomes more marked than would be the case with a spun yarn.

The denier range of "Taslan" yarns at present available is from 40 den. to 4,000 or more. In addition to producing normal single component "Taslan" yarns. the process is capable of producing a great variety of products and intimate blends of two fibres can be obtained by this method, and also special effects such as two colour blends and the production of very high bulk yarns due to relatively high overfeeds of one component gives endless scope for development.

### Fabric Properties

The properties of the yarn are intermediate between spun and filament. It has 50% greater volume than its filament counter-part and 20% more than the spun yarn of equivalent count, and it is important to remember this factor in the design of fabrics in order to avoid over construction. The strength properties of the yarn lie between a spun and filament, and fabrics made from them show a greater bulk, dryer handle, more cover and a more subdued lustre than filament fabric. Also, these yarns have a much reduced tendency to slip and, consequently, lower constructions of fabrics are both possible and desirable. Compared with fabrics made from spun yarns, "Taslan" produces one with a lower density, dryer and crisper handle with high pill resistance and, of course, much greater uniformity.

### Weaving Technique

In preparing warps, sizing is carried out in the normal filament manner but an additional heavy coating of a wax compound enables the loops to pass one another in shedding and overcomes complete locking of the sheds which would otherwise be the case. In addition to this, high warp tensions, deep staggered shedding, the lowest possible number of ends per dent and a temple which will hold the cloth out to reed width are all essential

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* *From a paper given recently to Burnley Textile Society.*

† *George Swindells and Son Ltd., Adelphi Mill, Bollington.*

features. Cloths of very high setts have been woven and here the use of a false reed to increase the splitting at beat-up is of great assistance.

In pirn winding it is important to remember that because of the bulking, not all the filaments are able to carry the load and, consequently, pirning tensions must be reduced accordingly to avoid excessive straining of the yarn. Fortunately, "Taslan" clings to the pirn very well and whereas with normal 70 den. filament nylon a pirning tension of 19/20 grammes would be permissible and necessary, in 70 den. "Taslan" textured nylon, pirning tensions of 12/14 grammes are both adequate and essential in order to obtain uniform cloth.

One important point is furring of the shuttle. The absolute minimum of fur necessary to avoid weft curling is essential. If a shuttle is furred in a way similar to that used for normal filament yarn, the tension when winding from the shuttle starts off at a comparatively low level, but increases as the pirn weaves down and can rise to as high as three times its initial value winding off to the base. Many cloth faults have been attributed to this factor.

### Finishing of "Taslan" Fabrics

As "Taslan" yarns have only been modified mechanically, they do not behave differently as regards dyeing, heat setting, etc. One way, however, in which great changes can be effected is by the amount of relaxation allowed in scouring and heat setting. If the fabric is scoured in the relaxed state in a beck, it gives the loops an opportunity to come to the surface of the cloth and results in a soft, bulky, dry handling cloth. In synthetic yarns, this effect can be further developed by the use of a can setting machine which allows further relaxation and movement. A smooth broad cloth effect can be obtained by scouring on a jig and setting on the stenter.

### Fabrics

Fabrics developed from these yarns have already been applied to a great variety of end uses, the most important being shirtings in a wide range from poplin type to the casual wool sport shirting. Other uses include light weight fabrics for printing where the dull ground is an ideal medium, blouse, nightwear, dressing gown, tie cloths, overall cloths, protective cloth, industrial filter cloths and proofing cloths where the loops of the "Taslan" offer an ideal keying point for the film coating. These yarns are also used in curtain lenos as they give an ideal non-slip weft and in dress and curtain laces where their extra covering power and dull effects are ideal for the figuring threads. Contrasting effects in jacquard woven fabrics can be extensively used and are being used in synthetic brocade furnishings and table linen fabrics. In handle, greater contrast and pluck resistance, they compare very favourably with their continuous filament relatives, and do not suffer from the pilling disadvantages of spun yarn fabrics.

One interesting fabric developed in America is said to be one of the first attempts to design a cloth by engineering principles is a nylon "Taslan" woven sheet. Previous disadvantages of nylon sheets were that their smooth surface led to bed-clothing slipping about, etc. After considerable experimental work "Taslan" yarn was used as alternate ends in the warp and gave a cloth with frictional properties similar to the cotton sheet, yet retaining all the advantages of the original nylon cloth. Due also to the increased covering power of the yarn, the sheet still came into the same price bracket and is now in commercial production and being developed in this country.

## *Electronic Slubcatchers*

(*continued from page* 60)

suitable for wool, linen, rayon, nylon, etc., as well as cotton.

The "cold" plate of the condenser serves as a mechanical and electrical shield and is not connected directly to the frame of the winding machine. The weak, earthed a.c. current of the "hot" plate is harmless and, since internal resistance is high, sparks cannot occur, even when there is a direct short-circuit.

By the use of the measuring condenser, capacitance is converted into voltage variations and a.c. amplified, the latter process being found more reliable, simpler and cheaper than corresponding d.c. amplification. Sensitivity need not generally be altered when winding yarn of different counts when the yarns are intended for corresponding weft qualities, and even when winding other materials such as nylon or wool, a reset appears to be unnecessary.

When a rapid increase in yarn mass occurs a positive electrical pulse is fed to the grid of the thyratron and, if the pulse height is sufficient, which happens when the slub thickness exceeds a certain minimum, the knife is attracted and cuts the yarn. A central setting is used for the minimum pulse height and this need not normally be altered for other types of yarns. A central power supply serves up to 50 units.

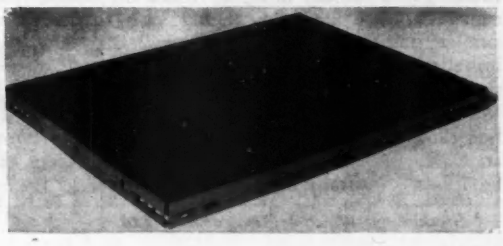
It has been found that about 95% of the slubs are detected by this method. The slight deviation is accounted for by the fact that the correlation between electronic weighing and visual estimation is slightly smaller than unity and great differences in density between slubs make it difficult to judge the mass by diameter alone. Rewinding a lot already cleared, but changing over all cones to other spindles in the same group, produces, however, only a very few additional slubs or none at all. The clearing ratio appears to be over 99%. Furthermore, in the case of the electronic slubcatcher, no extra stops are caused for extraneous reasons such as dust, knots, seeds, neps, etc., as happens with mechanical devices, while abrasion is eliminated.

Costs of the electronic system are estimated at about ¼d. per slub caught, while savings in the weaving shed through greater efficiency and fewer stops and a better quality product are said to amount to a minimum of 3d. and a maximum of 3s. per slub depending on the product. It is also claimed that the total cost per spindle per annum is often recovered in a month or less.

# High Load Carrying Shelves

TWO new steel shelves have recently been added by Handy Angle Ltd., Grand Buildings, Trafalgar Square, London, W.C.2, to their current range of products. It is claimed that these shelves 2 ft. wide × 18 ins. deep, and 2 ft. wide × 24 ins. deep will greatly add to the adaptability of the firm's angle for racking purposes. With the new shelves it is now possible to design racks in units of 2, 3, 4, 5, 6 ft., etc., where before it was only possible to build to units of 3 ft.

The new shelves are produced to the same specification as others manufactured by the company from 20 s.w.g. cold rolled steel. Edges are double flat folded, and the shelves, finished in the standard satin bronze colour, bolt direct to the slotted angle upright. They have a distributed load carrying capacity of approximately 1,500 lbs. Sold in packets of six the prices include a supply of nuts, bolts, washers and anchor plates.



**Available either 18 or 24 ins. deep, these shelves have a distributed load carrying capacity of approximately 1,500 lbs.**

# Wool Fabrics: Light, Medium and Heavy

*Descriptions with the widths, ends, picks and counts, also the uses of a wide range of woollen and worsted fabrics designed for dress fabrics, suitings, coatings and mantlings, etc.*

By W. MIDDLEBROOK*

FABRICS of wool have been made in the British Isles since pre-historic times; the name "wool," describing the fleece from a sheep, comes directly from the Anglo-Saxon *wul* or *wulle*. There is *worsted*, too, but this also is pure wool, the only difference being in the method of spinning the hair fibres. Woollen yarns are made on the spindle draft principle, being drawn and twisted simultaneously to produce a thick, hairy yarn; worsted yarns are spun on the roller draft principle, the fibres being arranged parallel with their length, then drawn and twisted successively. This means that *wool* is used for close, solid fabrics where ornament is not of first importance, while *worsted* is for cloths with clearly defined patterns or designs; where *wool* is rough and hairy, *worsted* is straight, even and lustrous. The name *worsted* comes from the Norfolk town of Worstead, where Flemish cloth weavers were encouraged to settle by Edward III in the twelfth century. For centuries, England was dependant on sheep raising and wool exports for prosperity; the Great Plague of 1348 so decimated the population that labour was scarce, and farmers turned mainly to sheep rearing as a result. This factor almost gave England a monopoly in wool exports, Spain being the only rival; by the beginning of the 19th century West of England cloth merchants were importing Spanish wool.

Woollen and worsted fabrics are mainly used for suitings and dress goods, mantle cloths, overcoatings, trouserings and the like. Light fabrics of the *muslin* type go by the general name of *mousseline*, and *mousseline delaine*, meaning "muslin of wool," is a fine worsted dress fabric, 60×50, 120s warp and weft; another muslin delaine, called *Challis*, is printed with faint designs. *Chiffon batiste* is used for evening dresses, a light all-wool fabric 48×44, 90s worsted yarns, and *camelteens* are plain fabrics of hair or wool for tropical suitings; hair fibres include mohair, alpaca, cashmere and camel hair, the last named being used for dressing jackets and hoseries, while the coarser fibres of camel hair are used for belting yarn. A fabric with a similar name to *camelteen* is *camleteen*, this being an imitation *camlet* from worsted yarns, used for summer wear, palm beach cloth and suitings.

The true *camlet* or *camelott* was made in India of camel hair, and was originally a fine dress fabric of camel hair and silk, and has since been made in a variety of combinations. Naturally enough, the name *camlet* is generally connected, mistakenly, with *camel*, but it actually comes from the Arabic *kham(a)lat*. The Dutch used to make *camlet* yarns of camel or goat hair, but the yarn used today is a fine worsted, 26s, with 13 turns per inch, a lustrous wool yarn. An entirely different fabric, with a small matt or basket weave in fibrous wool yarns, is called *camelina*.

*Nun's cloth* is a fine worsted dress fabric, plain weave, and *nun's veiling* another fine worsted used for blouses, 44×46, 48s/60s. An open weave cloth with a smooth finish, used for straining sauces and the like, is the worsted *tamis*, a sieve cloth. *Panama* is a fine worsted dress fabric, plain weave, piece dyed, while *china crepe* can be made from fine worsted in imitation of the raw silk gauze. Another imitation is *marbrinus*, a worsted fabric with a pale warp and coloured weft to imitate the veining of marble, an imitation of the silk and wool fabric called *marble silk*. *Bombazet*, introduced by Dutch settlers in the reign of Henry I, may be plain weave or twill, of hard spun worsted, and *naturalia* is a light worsted suiting for tropical wear.

## Wool

*Baby flannel* is a light, plain fabric of soft, white wool. *Flannel*, used for underclothes, advertising, aprons, bath robes, bedspreads, buffers, womens' coats, theatrical and carnival costumes, dolls, dress goods, gloves, infant wear, linings, pyjamas and nightgowns, scarves, shirts, shoes, mens' suits, table runners, face cloths, toys and trimmings, may be plain or twill, an all-wool plain fabric being 38×40, 30s/26s. *Flannel* was made in Wales in Tudor times, and Shakespeare calls a Welshman a "flannel"; the word was formerly *flannen*, which could be from the Welsh *gwlanen* (*gwlan* means "wool") or the Old French *flaine*, meaning "a blanket." Another form of *baby flannel* is *patent flannel*, a light flannel of Welsh wool that is plain white or pink, the term patent applying to its non-shrinking properties.

*Ripple cloth* is a wool fabric with a raised face forming ripples, used for dressing gowns; a cheaper form is also made in cotton, with a soft weft that can be easily napped. *Eiderdown cloth* is a loosely woven fabric with a long nap at both sides, used for women's and children's wear; another fine woollen, specially made as underwear for people with tender skins, was *Saxony gauze*. *Pyjama stripes* can be made of pure wool; *check mohair* is a small-patterned wool check for children's wear; *hairline tri-colour* is an imitation hairline fabric with a wool warp and worsted weft, using three colours of warp and weft.

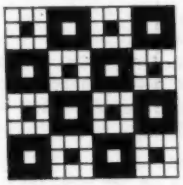
* *Brocklehurst-Whiston Amalgamated Ltd.*

*Mistral* is a dress fabric using fancy wool yarns, 40×48, with coarse snub or flake yarns; another fine dress fabric in natural colours is *Lavena*. *Grenadine*, a dress fabric with an open gauze weave, may be all of wool, and *grenadine crepon* is a black woollen dress fabric with open check patterns and ribs. *Cordurette*, as the name implies, is a warp cord dress fabric of wool that may be plain or twill.

### Medium Weight Worsteds

*Crepe flannel* is a plain weave sports fabric with a crepe finish; another plain worsted, a stout fabric of 2- or 3-fold warp yarns with single weft of a different colour, is *malines*. A hopsack weave, shown at Fig. 32, is used for the dress fabric known as *serge canvas*, an end of plain weave separating each small hopsack repeat; one quality has 46 ends per inch of 2/16s worsted for the hopsack and 2/36s worsted for the plain ends, with 26 picks per inch of 8s worsted weft.

*Bunting*, most familiar in its use for flags and decorations, is a plain worsted fabric; the name may have come from the obsolete *bunt* and the Middle English *bonten*, meaning "to bolt or sift flour." The French *étamine* means both bolting or sifting cloth and bunting. Another suggested derivation is the German *bunt*, which means "bright and gay." *Bunting* is used for advertising, theatrical and carnival costumes, curtains, flags and streamers.



(left) Fig. 32
(right) Fig. 33

Worsted *trouserings* vary considerably in quality, one with a high rate of ends per inch being 136×60, 2/40s warp and 2/20s weft. *Botany worsted trouserings*, of wool which takes its name from the Australian Botany Bay, may vary from 52×50, 2/24s warp and 2/28s weft to 132×128, 2/48s worsted warp and weft. *Botany worsted coatings* vary from 36×36, 2/14s warp and weft, to 144×136, 2/70s warp and weft, while *worsted suitings* may be 42×42, 2/18s, or 68×68, 2/48s warp and weft.

### Medium Weight Wools

*Russian cloth* is a wool costume cloth with a plain weave, while *ratine* is a rough woollen striped dress fabric. Another dress fabric is *peau de suede*, a napped woollen material with a plaid check pattern, as also is *ballanges*, a plain weave dress fabric that may be all wool, or flax warp with a wool weft. *Pachas* is a plain coating of mohair. In "Merry Wives of Windsor" Shakespeare uses the word "flannel" as a term of contempt when he makes Falstaff say of Sir Hugh Evans "I am not able to answer the Welsh flannel." *Baby flannel* has already been mentioned, but there is also *Lancashire flannel*, a Rochdale product with a blue woollen warp and white selvedges. *Flannelle de chine* is a similar fabric, blue with white selvedges, but in this case the selvedges are of cotton, and the wool warp is dyed blue, leaving the selvedges white. *Taffetas flannel* is a woollen shirting fabric for sportswear, made in stripes, checks and solid colours; wool *taffeta* is also used for high quality shirts, and *bolivar* is an all-wool flannel for underwear.

*Billiard cloth* or *felt* is one of the finest woollen fabrics, a cloth of the beaver type that may be plain weave or a 3-shaft twill. *Polo cloth* is a double-faced woollen of soft yarns and an open weave. *Kashgar cloth* is of camel hair, a thick but light dress fabric of Kashgar wool, which comes from Chinese Turkestan. Another plain wool of soft yarns is called *thibet*, a well felted material in dark shades for men's wear. *Palm beach cloth*, of plain dyed wools, is used for suitings and dresses; *pepper and salt* gives fine mixed effects in wool and worsted.

### Heavy Woollen Fabrics

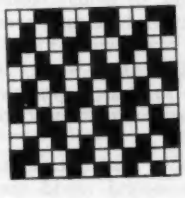
Among the heaviest of woollen fabrics, requiring strong, slow-running looms with positive dobbies, are overcoatings, reversible cloths, melton and beaver cloth, naps and cords. Where a *botany worsted trousering* may be as low as 6 ozs./yd. finished, *melton* and *beaver cloth* may be 33 ozs., *naps* 37, *cords* 32 and *overcoatings* 28 ozs./yd. *Cheviot overcoatings* may range from 18×16, 8s warp and weft, to 46×38, 14s warp and weft. *Saxony overcoatings* may be 24×23, 8s warp and weft, or 42×34, 14s/12s. *Saxony woollens* are of botany wool spun on the woollen principle. *Cheviot woollens* are made of crossbred wool spun on the woollen principle. The *Saxony wheel*, used for over 200 years for the spinning of wool and flax, quickly followed the *Jersey wheel*, introduced into England in 1530.

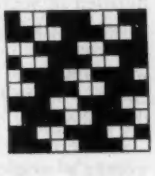
*Bearskin* is the American name for a shaggy-faced overcoating that is also known as *dreadnought* and *fearnought*; the French name for this cloth is *peau d'ours*. The term *fearnought* applies to *Cheviot overcoatings*, and *Cheviot* is often used to describe a heavy woollen fabric with a shaggy face. The name comes from a hardy sheep reared on the Cheviot hills, and the fabric is used for womens' coats, overcoats and upholstery. Another heavy, shaggy overcoat fabric similar to *bearskin* is *Kalmuck*; the Kalmucks were a Mongol race of Russia and Central Asia, natives of *Astrakhan*, and the name was given to a rough, hairy cloth of coarse, dyed cotton made in Persia.

*Llama coating* is an overcoat cloth, the true fabric being a llama wool-faced fabric finished with a long nap specially rippled. The woollen counterpart may be 52×70, usually made in browns and greens. *Petersham cloth* is an indigo overcoating with a thick nap, and *Ulster cloth* is another heavy overcoating, as is *gold cloth*, a double cloth in which face and back differ in colour and pattern. *Chinchilla* is a rough-faced overcoating of long fibre wool.

*Beaver* is an overcoat cloth of fine grade wool with a napped finish to imitate the skin or fur of a beaver; cheap varieties are made with cotton warp and shoddy weft. *Beaver cloth*, weighing 30 ozs./yd. finished, has two warps and two wefts, 100×75, 32s warps and 32s/15s wefts, with a dressed finish. *Melton*, shown in Fig. 33, is a heavy, smooth wool fabric with a milled finish, used as overcoatings and for hunting clothes, the name coming from the Melton Mobray hunt. Qualities include 46×54, 16s/20s, 33 ozs./yd., and 46×64, 34s/30s, 20 ozs./yd. *Naps* are overcoating cloths with indigo dyed yarns, 28×28, 8s/8s, 28 ozs./yd., and 30×50, 2/28s cotton warp and 6s wool weft, 37 ozs./yd., with a napped finish that completely hides the weave, shown at Fig. 34.

*Blanket cloth* is a West of England trade term for heavy





(left) Fig. 34
(right) Fig. 35

overcoating, the name coming from Thomas Blanket of Bristol, who first made blanket cloth in this country under the reign of Edward III. Gaily-coloured blankets, used as portiere curtains, are called *Austrian blankets*. *Russian blanket* is another striped fabric, a heavy cloth thickly napped at each side, with a wool warp and mohair weft, the stripes being weft bars. *Balmoral* is striped with red, blue and black, a strong and heavy petticoat cloth used in Scotland. Checked fabrics include *algerienne*, of coarse woollen yarns, used for curtains, tents and awnings in North Africa, and *gun room checks*, with a small cross check for sportswear. *Albert cloth*, a double-faced overcoating fabric with a different design on each side, may be in stripes or checks of colour. *Tartans* or *plaids*, in plain or will weaves, are well known as true cross checks, with a range of patterns that covers any clan in Scotland and many more beside.

*Sealskin cloth*, an imitation of the real sealskin fur, is made of the finest mohair; this type of wool is from the angora goat, found in Asia Minor and South Africa: it has a brilliant lustre, has excellent piling properties, and is unsurpassed except by pure silk for some classes of rich velvets. Mohair is made into yarns for velvets, sicilians, lustres and linings. *Carcelles* is a trousering cloth of camel hair yarns, and *cilace* a coarse cloth of goat's hair, used as penitent shirts for monks.

*Barcan* uses angora wool, with a 3-fold warp of 1 silk, 2 goat's hair and 3-fold angora wool weft to make a heavy ribbed fabric once made in Holland. *Ecosse* or *tricot* is another ribbed fabric with two colours of weft, made either with cotton or wool; *tricot* is really knitting or knitted work, a soft, slightly ribbed cloth, and the French *tricot* means "knitting." *Biarritz cloth* is a reversible woollen weft cord stripe on a warp rep ground, and *Bedford cloth* is an all-wool dress goods fabric of russet cord.

A close weave black wool, first made in Bohemia for the clergy and *alumi*, is called *alumnat cloth*. Another black cloth for dress suitings is the West of England *black superfine Dress suitings* are made of fine worsted yarns, with such qualities as 56×60, 2/36s warp and 1/18s weft; and 165×100, 2/70s/32s.

*Casimer* is a summer dress fabric with a fine worsted warp and woollen weft; the name springs from cashmere a soft woollen material made from the hair of the Tibetan or Kashmir goat. Other spellings of *cashmere* are *cassimere* and *kerseymere*, fine fabrics of sheep's wool for men's wear, but *kerseymere* must not be confused with *kersey*, a coarse fabric once made at Kersey, in Suffolk. Cashmere, vicuna or goat's hair is used to form one side of the double-face dress fabric called *napier cloth*, the other side being wool. Another dress goods fabric, with the nap raised in squares, dots or other simple figures, is *mosambique*.

*Kennets* are coarse woollen sports suitings of Welsh wool; *Karakul cloth* is a fine wool astrakhan coating, made to imitate Persian lambskin. *Batswing* is a thick and coarse cloth woven as a seamless petticoat. *Feather cloth* is a coating fabric so-named because wool and feather down are twisted together for the weft, the warp being undyed wool. A *moss-finished cloth* is a woollen fabric of fancy colours, finished in such a way that the design can be clearly seen; *Montana coating*, the design of which is shown at Fig. 35, is a whipcord fabric for ladies' wear, of Montana wool, with warp and weft in different colours to produce a two-tone effect. *Carriage cloth* is a form of wool moquette used in the upholstery of trains and omnibuses.

Duffle coats have become a fashion in both men's and women's wear since the end of the second world war; worn by men in the fighting services, especially those exposed to the elements, such as watch-keepers aboard ship, their immense value as keepers-out of the cold was appreciated by all who used them, and the post-war sales of surplus Government stocks helped the fashion to spread. Sailors call them "llama coats" or lammy coats, the garments being fitted with a capacious hood that envelops the head, like the hooded robes worn by the Tibetan monks or lamas. *Duffle* is really a low-grade blanket, made of poor quality woollen yarns, and the name comes from Duffel, a town in Brabant, near Antwerp.

*Broadcloth*, which really means "double width," is a stout wool cloth of fine merino yarns, with a heavily-milled, dress-face finish; the American *broadcloth* is all cotton, and is used for sportswear, boudoir caps, casket or coffin linings, women's coats, men's collars, theatrical and carnival costumes, cushion and pillow covers, dolls, dress goods, fancy work and embroideries, infant wear, lamp shades, luggage linings, table napkins, pyjamas, screens and partitions, shirts, shrouds, smocks, table coverings, toys, trimmings, umbrellas and parasols, underwear and upholstery.

Of the true English *broadcloth*, Daniel Defoe wrote in the early 18th century: "Nothing can answer all the ends of dress but good English broadcloth, fine camblets, druggets, serges and such like." *Baize* is a heavy woollen cloth of coarse yarns, loosely woven, with a long nap at both sides; in the 17th century *baize* meant "woollen cloth," and the name springs from the Latin *badius*, meaning "bay-coloured," and the later French *baye*, the plural of which gave the English form. *Baize* is used for bases—protectors against scratching, linings, silence cloths and aprons.

Many woollen cloths may be classed as pile fabrics because of their naturally hairy surface; others, like blanket cloth, have a napped finish to raise this natural pile, and a few have cut pile like true velvets. *Duvetyn* is a soft wool fabric with a fine, short nap that resembles velvet, used for coats, suits and dresses; from the French *duvet*, which means "down," this is a soft, downy fabric that may also be known as "mouse-skin" or "doeskin."

Another mock velvet is *mockado*, made in brocade designs, with wool yarn that is heavily raised in the finishing process. Mohair yarns are sometimes used for making *plush*, a fabric with a longer pile than velvet, one example being *mohair beaver plush*. *Bolivia* is a worsted pile dress cloth used for suitings and coats.

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### Tachometer Alternator

Made and distributed by J. Edward Hall (Elec. Engineers), Ltd. The Tower, 140 Raby Street, Manchester 14, the "Revicon" tachometer alternator is a speed indicating equipment, consisting of an alternator driven directly or through suitable drive from the shaft to be monitored, and an indicator on which the speed is shown. The indicators are totally enclosed, oil, dust, and splash proof, and are designed for foot mounting with a shaft extension in any position for coupling to pinion, chain, "V," flat or round belt drive.

The linear output voltage over a given speed range is continuously rated, and the equipment is suitable for operation directly on shaft speeds up to 3,000 r.p.m. A full range of indicators is available from 4 to 12 ins. dia., near linear graduation; 270° arc; single or multiple as required. In addition, speed sensitive relays are available, arranged to operate under conditions of speed failure or variation from pre-set values, and are available in single and multiple designs to cover a wide range of application.

# Spinning, Weaving and Finishing "Terylene"/Cotton Yarns and Fabrics*

*Recommendations for spinning staple on the cotton system, sizing and weaving requirements, fabric construction, with dyeing, printing and finishing techniques*

By G. W. MANOCK†

THREE types of "Terylene" are made for the cotton system: 3 den. 1½ ins. and 2 ins., and 1½ den. 1½ ins. The spinning limit of these fibres in the 100% form or in a 67/33 blend with cotton is approximately 1/32's for the 3 den. fibre and 1/80's in the case of the 1½ den. fibre. A wide range of counts is therefore available suitable for the majority of "cotton" outlets. With regard to spinning performance "Terylene" staple differs from cotton in three important properties:—

(1) As supplied it is a clean and open fibre.
(2) It has a high resilience and low density which result in a bulky sliver.
(3) It has a high interfibre friction.

Due to the condition of the baled fibre only a mild opening and carding treatment is required. Excessive working of the fibre during these operations will only result in nep formation. The usual practice is to open and card the 1½ den. fibre alone and then to blend with cotton at the drawframe. The preferred sequence of opening units consists of bale breaker, hopper feeder, Kischner beater and lap end. It is recommended that lap weights should not exceed 8 - 9 oz./sq. yd.

The 3 den. 1½ ins. fibre may be carded on conventional cotton cards, clothed with either metallic or fillet wire, with only minor adjustments in settings and speeds. In the case of 1½ den. fibre there is a pronounced tendency for the fibre to load the cylinder on conventional cards. Two methods of carding without loading are known and have been used commercially with success. Firstly, a metallic wire card may be used if the wire is ground to replace the points with a flat carding surface, although some firms have processed "Terylene" on unground metallic cards. Secondly, a fillet card fitted with a fancy roller may be used. The action of the fancy lifts the fibres to the surface of the cylinder and this prevents loading. A higher rate of production may be obtained with the fillet and fancy technique. Blending with cotton should be done at the drawframe and three passes ensure an adequate blend.

To give the recommended 67/33 blend, two slivers of cotton and four of "Terylene" may be fed to the drawframe with the cotton in the 1 and 6 positions. When spinning fine counts a combed cotton is used and in this case the "Terylene" should be drawn once before blending. Combing removes motes and shives which can be difficult to remove during finishing. Kier boiling normally removes these impurities but this process cannot be used with "Terylene." Due to the high interfibre friction of "Terylene" low roving twist should be used to ensure good drafting. A twist factor between 0·6 and 0·7 is recommended.

A fine Egyptian or Sudan cotton is used for blending with 1½ den. fibre and a coarser cotton such as Peruvian for the 3 den. fibre. Twist is an important factor in the control of pilling and certain minimum twists are recommended, e.g., singles yarn, twist factor 4·0 and two fold yarn, singles twist factor—3·5 with 100 - 120% doubling twist. With high twists the yarn may be lively and if required should be twist set. This can be done in a steam chamber at atmospheric steam for 20 mins. or 10 lb./sq. in. steam for 10 mins. is effective.

## Sizing

All singles yarns should be sized and two fold yarns, especially if of fine counts, may be sized with advantage. Sizing presents few problems. Conventional equipment may be used and very good results have been obtained. Good weaving performances have been obtained with sizes based on poly vinyl alcohol, starch and a lubricant. More recent work has shown sizes based on just starches and lubricants to be promising but there are still problems to be overcome with this type of mix.

## Weaving

The 100% "Terylene" or 67/33 "Terylene"/cotton yarns are elastic and strong and weave well in cotton type looms. Compared with cotton three most important points should be considered.

(1) Sizing is most important and should lay all the projecting fibres along the yarn and also prevent excessive fluffing of the warp during weaving. Fluffing of warp during weaving is thought to be one of the causes of pilling and care should be taken to avoid it by sizing and the use of smooth heald eyes.

(2) "Terylene" fibre, unlike cotton, does not swell and thus only a low shrinkage occurs during finishing. For this reason great care should be taken to weave for cover and to minimise reediness in the loom rather than hoping that the finisher will improve the fabric appearance. The techniques for minimising reediness and giving cover are well known to all weavers. It will, therefore, be sufficient to say that techniques such as raising the backrest, depressing the healds and the use of fine reeds should be employed to obtain a loomstate cloth of the optimum appearance.

(3) Finishers can have difficulty in removing stains from "Terylene" fabrics and it is therefore most important to try to keep dirt away from the cloth. Looms should be cleaned regularly and excess oiling avoided. Also it is advisable to parcel fabrics even when loomstate.

Such spotting agents as "cyclohexanol" are not effective as they rely on kiering for their effect. BRRASK AY has been found an effective spotting agent and British Rayon Research Association will be pleased to explain its use. Lissapol N (I.C.I.) is also an effective spotting agent but this is more often used by finishers than weavers.

## Fabric Construction

Fabric construction is most important as it is one of the major factors controlling pilling. Pilling is the migration of fibres to the surface of a fabric where they become entangled into balls or pills. Pilling may be associated with all spun fabrics containing fibres that are strong and that have a high abrasion resistance. Cotton fabrics pill in some cases, as also do some knitted goods and cheap bed sheets. In firmer cotton fabrics there is no doubt that fibres do move to the surface but they are quickly broken off or abraded away during wear.

If fabrics containing "Terylene" are constructed and finished correctly a satisfactory performance may be obtained. If either of these two factors is neglected a fabric will tend to pill. Correct fabric construction cannot therefore be over

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* *Abstract from a paper "Properties and Uses of "Terylene" Polyester Fibre with Particular Reference to the Development of Cotton Type Staples Outlets" given recently to Bury and District Textile Society.*

† *I.C.I. Ltd., Fibres Division, Harrogate.*

emphasised. In calculating a loom sett it is important to note the low shrinkage obtained in finishing. The factors to be considered in constructing a cloth to have the best resistance to pilling and fluffing are (*a*) yarn construction (*b*) sett and (*c*) weave.

Two fold yarns provide an excellent, but expensive, means of controlling pilling. In some types of fabric woven from coarser count yarn it is imperative to use two fold yarns. The sett of the fabrics should be as high as possible taking into account handle, appearance and crease recovery. Long floats should be avoided where possible so that in the case of drill and denim fabrics, alternative constructions in 2/1 and 2/2 twill weaves are to be preferred. Satin or sateen weaves are not suitable for "Terylene" spun yarns for this reason.

### Finishing

This discussion of finishing is brief but it does provide an opportunity to mention some of the problems that may arise. Take for example the finishing of a white 67/33 "Terylene"/cotton shirting. I have chosen this because a shirting is a most critical fabric and one that must have excellent dimensional stability and resistance to pilling. The action of a stubble beard, particularly if accompanied by a short neck, gives rise to the most severe treatment a fabric is likely to encounter.

A typical finishing treatment would be: (*a*) scour, (*b*) mercerise, (*c*) heat set, (*d*) singe, (*e*) bleach and (*f*) compressive shrink. A scour in a suitable detergent (soap and soda) at about 60°C. is sufficient to desize the fabric if a soluble starch is used. If a normal starch has been used desizing should be done before scouring. Scouring should be continued until the fabric is clean and it is important that no heat treatment is given to a dirty cloth otherwise such soil may be impossible to remove.

Mercerising has not the same effect on a 67/33 "Terylene"/cotton fabric as it has on an all-cotton cloth. It is nevertheless a most useful treatment and does impart some lustre. It forms an effective method of eliminating the progressive shrinkage of cotton and also improves its dye uptake.

Heat setting is carried out to fix the dimensions of the "Terylene" component. It also improves the crease recovery and pill resistance and is therefore a most important process. Heat setting is normally done at 180°C. for about 30 secs. on a hot air stenter.

Singeing is the process where most trouble has been met. The process must be thorough to remove all surface fibre. This is required to control pilling. "Terylene" will melt if the flame is too hot or the fabric speed too slow. If the conditions are too mild a satisfactory result will not be obtained. A safe method is to pass the fabric several times through the machine under mild conditions. This should be repeated until the fabric has a clear surface and because of the mild conditions there is little risk of damage. Heavier fabrics should be brushed and cropped prior to singeing. This treatment facilitates the obtaining of a clear surface and reduces the size of the polymer beads formed during singeing.

The fabric will then be bleached and of the common bleaches sodium chlorite is the most effective. It is also common practice to apply an optical bleach so that the popular "whiter than white" is obtained. After singeing, the fabric has a harsh handle due to the beads of polymer and bleaching forms an effective method of softening the cloth. Finally, the fabric is compressively shrunk to stabilise the cotton and to give a fabric of required dimensional stability.

### Dyeing

It is important to dye a fabric before singeing as the beads of polymer tend to dye to a darker shade. Also as mentioned earlier, dyeing is done after heat setting. The position of dyeing in the sequence is therefore fixed. Disperse acetate dyestuffs and some azoic combinations are widely used and a large range of shades is available. For maximum brightness both the cotton and the "Terylene" component should be dyed to the same shade. Differential abrasion may occur if cross dyed effects are attempted.

### Printing

Various printing techniques may be used successfully to print either 100% "Terylene" or 67/33 "Terylene"/cotton fabrics and bright fast shades may be obtained. Pigment prints and the use of disperse dyestuffs either alone or with mixtures of dyestuffs substantive to cotton, in the case of blended fabrics, are the principal techniques used.

### Fabric Properties

What are the advantages to be gained in using a "Terylene"/cotton fabric as against an all cotton fabric?

The presence of 67% "Terylene" in a blend with cotton gives a fabric of increased tear strength, resistance to abrasion and crease recovery. The fabrics are quick to dry and depending on the method of washing, require little or no ironing. Also fabrics containing at least 50% "Terylene" in blends with cotton may have durable pleats inserted in the same way as 55/45 "Terylene"/wool fabrics. Similarly, a durable embossed effect may be obtained by the action of heat due to the thermoplastic nature of the fibre.

Whilst all these properties are at their best in 100% "Terylene" fabrics, they are attended by certain disadvantages of which the tendency to attract dust and fluff is probably the most objectionable. To reduce these defects to an insignificant level for garments a certain proportion of cotton is added, the optimum blend being 67% "Terylene", 33% cotton. This percentage of cotton increases the absorbency, reduces any static propensity and also contributes to fabric handle. In some cases such as curtains, furnishings and ties, fabrics made from 100% "Terylene" will be more suitable than a blended fabric.

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# *Tropical Weight Fancy Worsteds*

**Photographed slightly larger than the actual patterns, the eight cloths on the facing page are a selection from the beautiful range of fancy worsteds manufactured by Melfar Manufacturing Co. Ltd., Spring Gardens Mill and Garden Vale Mill, Colne. Available in a variety of shades, these attractive fancy worsteds are 9/10 ozs., 58 ins. tropicals, made from a 70's quality yarn. Brief details are as follows :—**

**(1) A neat pin-head effect with coloured square check.**

**(2) Simple tone-on-tone block check. The use of twist yarns imparts a distinctive sparkling effect.**

**(3) Traditional basket weave with very fine cotton stripe. Colour introduced to give all-over effect.**

**(4) Pronounced stripe effect with multi-coloured twists as over-check.**

**(5) Classic Glen with coloured double over-check.**

**(6) A discreet shadow check in extremely attractive shades.**

**(7) Direct all-over effect which emphasises the lovely character of the cloth resulting from the use of coloured twists.**

**(8) A bold check effect with multi-coloured twists as double-stripe.**

# Further Important Data on the Re-Positioned Fancy

*A report of more work carried out in the University of Leeds and in industry on this important aspect of carding*

By T. W. G. ASHDOWN and P. P. TOWNEND, B.SC., PH.D., F.T.I.*

CONSIDERABLE interest was aroused by the article "A New Technique for Increasing the Opening Power of Cards" ("T.M.," August, 1957, page 402) which described experiments carried out under the auspices of the Wool Textile Research Council, to demonstrate that an increase in carding efficiency could be obtained by placing the fancy roller either underneath the card or in the position normally occupied by the second worker. Using a one swift experimental card, the details of which are given in Table 1, in which the swift, workers and doffer were clothed with 140/14/35, the strippers with 90/9/30 and the fancy with 29s gauge "Rotomatic" wire, it was shown that the nep content of a 70's lamb's wool blend could be reduced from 185 neps/gm. to 59 neps/gm. simply by re-positioning the fancy. In regard to thread removal it was revealed that treatment by one swift employing the re-positioned fancy was as effective as three swifts with the fancy in the conventional position.

**Table 1. Machine Details**

| Rollers | Diameter (ins.) | r.p.m. | Width of roller (ins.) |
|---|---|---|---|
| Swift .. .. | 42 | 86 | 20 |
| Workers (8) .. | 8 | 4 | ,, |
| Strippers (5) .. | 4 | 293 | ,, |
| Doffer .. .. | 29 | 3·5 | ,, |
| Fancy ("Rotomatic") | 12·5 | 348 | ,, |

Whilst the previous article dealt with the obvious advantages of increasing the carding power of a swift a number of questions still remained unanswered. For example, which worker position should the fancy occupy? Will the re-positioned fancy cause more fettling? How strong is the yarn produced by this new method and how does this new technique affect variation across the card? This article is an attempt to answer these questions.

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## Effect of Fancy Position on Carding Power

Although it has been established that the carding power of a swift can be improved by re-positioning the fancy, it has not been demonstrated which position is the best one for the fancy to occupy, i.e. whether the fancy should replace the second, third, fourth, or fifth worker. A series of experiments using the same experimental carding machine as in the earlier work has been carried out by J. Huber-Sannwald of this department to solve this problem.

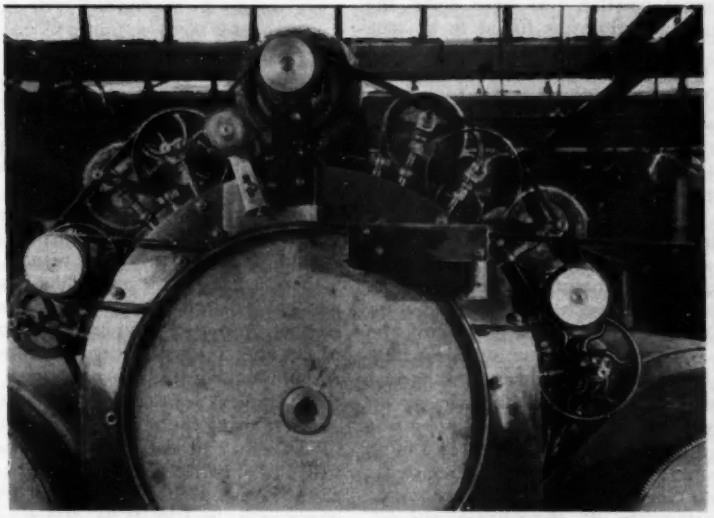
For this series, the clothing on the swift, workers and doffer was changed from 140/14/35 to 100/10/30 since the former was considered too fine for use as a first swift. The fancy was clothed with 29s gauge "Rotomatic" wire and the strippers with 90/9/30 wire. Roller speeds remained constant throughout the whole series. The worker settings, doffer settings and procedure for the five experiments involved, using five different fancy positions, are set out in Table 2.

The same 70's lamb's wool blend was used as before, to which 10% of

**Table 2. Machine Settings and Experimental Scheme**

| Expt. 1 | Expt. 2 | Expt. 3 | Expt. 4 | Expt. 5 |
|---|---|---|---|---|
| $W_1$ 20s g. | $W_1$ 20s g. | $W_1$ 20s g. | $W_1$ 20s g. | $W_1$ 20s g. |
| $W_2$ 22s g. | $W_2$ 22s g. | $W_2$ 22s g. | $W_2$ 22s g. | F |
| $W_3$ 24s g. | $W_3$ 24s g. | $W_3$ 26s g. | F | $W_2$ 22s g. |
| $W_4$ 26s g. | $W_4$ 26s g. | F | $W_3$ 22s g. | $W_3$ 24s g. |
| $W_5$ 28s g. | F | $W_4$ 22s g. | $W_4$ 24s g. | $W_4$ 26s g. |
| F | $W_5$ 22s g. | $W_5$ 28s g. | $W_5$ 28s g. | $W_5$ 28s g. |
| D 28s g. | D 28s g. | D 28s g. | D 28s g. | D 28s g. |

$W_1$ = First worker, $W_2$ = Second worker . . . etc.
F = Fancy, D = Doffer, g = gauge



Re-positioned fancy as fitted by Chadwick Machine Co. Ltd., in the mill of J. W. Whitworth and Co. Ltd., Luddendenfoot

oleine and 5% of 16 skeins woollen threads, cut into 1½ ins. lengths, had been added. Any differences in carding power brought about by changing the position of the fancy could now be compared by assessing neppiness and threadiness in the card webs. A rate of feed equivalent to 20 lb./hr. on a 60 ins. wide card was maintained in every experiment and samples of web were taken from the doffer in an open form after one, two and three passages through the one swift card for testing purposes. The figures for neppiness and threadiness are the average of four determinations on samples of web approximately 36 by 22 ins.

### Threadiness

The figures in Table 3 show the % threadiness of the webs produced under the various conditions. The web with the highest thread content has been represented as 100, the other figures being calculated on this basis.

Table 3

| Experiment | No. of workers following fancy | % Threadiness | | |
|---|---|---|---|---|
| | | 1 Swift | 2 Swifts | 3 Swifts |
| 1 | 0 | 100 | 49 | 37 |
| 2 | 1 | 69 | 28 | 15 |
| 3 | 2 | 73 | 27 | 5 |
| 4 | 3 | 53 | 27 | 10 |
| 5 | 4 | 71 | 44 | 7 |

It will be observed from Table 3 that the worst web was produced after treatment by one swift when the fancy occupied its normal position (expt. 1).

Comparing the figures vertically, for material carded on one swift it will also be seen that the thread content was considerably lower for any position of the fancy other than the normal one. For material carded on two swifts, the web produced with the fancy in the normal position was once again the worst and this was found to be true of material carded on three swifts.

If the figures are compared horizontally it will be seen that the threadiness was reduced in every experiment as more swifts were used. It is, however, interesting to note that the lowest thread content obtained with the fancy in the conventional position was 37% which was two and a half times greater than any of the figures after three swifts using the other fancy positions. And from these figures it would seem that two swifts of carding with the re-positioned fancy are approximately equal to three swifts using the normal position, since the threadiness in experiments 2, 3, 4 and 5 after two swifts were 28%, 27%, 27%, and 44%, respectively, whereas after three swifts with the fancy in its conventional position the % threadiness was 37. From these data it would seem that more efficient thread removal will obtain with the fancy in any position other than the normal one.

Table 4

| Experiment | No. of workers following fancy | Neps/gm. | | |
|---|---|---|---|---|
| | | 1 Swift | 2 Swifts | 3 Swifts |
| 1 | 0 | 149 | 88 | 70 |
| 2 | 1 | 128 | 70 | 51 |
| 3 | 2 | 125 | 62 | 37 |
| 4 | 3 | 113 | 79 | 50 |
| 5 | 4 | 136 | 95 | 64 |

### Neppiness

As a further means of comparison the neppiness of the webs resulting from the fine wool blend was assessed and the results are presented in Table 4. Again, comparing the figures vertically in Table 4, it will be seen that for material carded on one swift there were fewer neps in every case when the fancy was not conventionally positioned. With webs produced after two swifts the neps/gm. were higher when the fancy was followed by four workers than in the normal position but followed by one, two or three workers the webs contained fewer neps.

Comparing the figures horizontally it will be seen that in every case the nep content was reduced as more swifts were used and the clearest web was produced when the fancy was followed by two workers only. Considering Tables 3 and 4 together it would seem that the position occupied by the fancy is not critical provided it is not placed in its conventional position and followed directly by the doffer. In these experiments it would seem that the worst webs were obtained with the fancy in the normal position and the fancy followed by four workers came next; but when the fancy was followed by three, two or one worker equally good results were obtained.

Compared with the first experiments when the card was clothed with 140/14/35 card wire, the results in Tables 3 and 4 for threadiness and neps/gm. do not show such a spectacular improvement in carding power using the re-positioning technique. Although thread and nep removal in this instance were considerably more effective using the re-positioning technique it may be that a greater benefit will be obtained when the card is clothed with 140/14/35 wire as compared with the 100/10/30. But such a generalisation is difficult to uphold since other variables affect the issue such as condition of wire, etc. So all one can say, at this stage, is that under both series of experiments the re-positioned fancy has provided better carding.

### Effect of Fancy Position on Fettling

These experiments were designed to investigate the effect of re-positioning the fancy on the amount of material accumulating as fettling waste on the various rollers of the card. An all wool blend of departmental waste was used and the card run for four-hour periods in each fancy position before fettling. It is realised that cards normally run for much longer periods without being fettled but since both time and material were limited, a four-hour period was considered to be sufficiently indicative of the form which the build up would take. The data given in Table 5 relate to the weights of fettlings removed from the card after running for this period.

If one considers the figures given for the fettlings from the various rollers, it will be seen that the load carried by the swift under any fancy position was extremely small, for instance, under the worst condition, the swift carried only one-fifth the load of a worker. And when one considers that the load carried by the same swift for a similar period of time, using a "Rotomatic" fancy, was approximately 3 gm. and 180 gm. using an ordinary fancy it will be realised that any differences between the figures given for the various fancy positions could well be due to differences in degree of cleaning the swift and not due to fancy positioning. In any case the largest figure for swift build up was only 5·5 gm. which is not considered to be of any moment. Indeed it was pointed out in the previous article that the success of this technique depends upon the fact that the build up in the swift is kept to a minimum.

Table 5

| Experiment | No. of workers following fancy | Weight of fettlings (gm.) | | | |
|---|---|---|---|---|---|
| | | Swift | Workers (5) | Strippers (5) | Doffer |
| 1 | 0 | 1·8 | 120 | 43 | 123 |
| 2 | 1 | 3·2 | 154 | 65 | 114 |
| 3 | 2 | 2·8 | 164 | 69 | 115 |
| 4 | 3 | 5·5 | 157 | 81 | 114 |
| 5 | 4 | 4·9 | 151 | 86 | 111 |

It will be seen that the weights of fud removed from both workers and strippers were lower with the conventional fancy position than with any other. This difference is ascribed to the fact that the workers carry greater loads when carding with the re-positioned fancy and so both they and the strippers retain more waste as

fettlings. The weight of fettlings removed from the doffer decreased slightly when the fancy was re-positioned but the decrease is not regarded as being significantly different from the conventional arrangement.

### Pilot Plant Experiments

The work described so far was carried out on the experimental one swift card but in order to obtain further data the trials were transferred to the pilot plant. This machine consists of a three swift scribbler, one swift intermediate and a two swift carder fitted with an autocount and a four height series tape condenser and is clothed with wire suitable for processing merino wools. Apart from being only half the normal width this machine is the same as many industrial carding machines engaged in the fine wool trade. Since this machine has already got sufficient swifts to produce well-carded slivers it was thought that the most important application of this technique would be to see whether we could improve the fibre arrangement and the levelness of webs fed to the condenser rather than add additional carding power.

In order to do this the fancy, clothed with "Rotomatic" wire, of the last swift of the carder was placed so that it was preceded by one worker and followed by two workers. An experiment was first made in which the performance of the card with the fancy in the ordinary position was compared with that of the same fancy in the new position. Settings, speeds and production remained constant throughout the experiment. Using a blend of mixed departmental wastes and shoddies the card was allowed to reach a steady rate of production after which a full set of condenser bobbins was made. A second set of bobbins from which the metal flanges could be removed was placed in the machine and allowed to collect slubbing for 40 mins. This procedure was carried out with the fancy in the ordinary and new positions.

The full condenser bobbins were all spun at the same time on the mule to ensure that the spinning conditions were identical. A note was made of the ends down in spinning and both sets of yarn were tested for twist, count and breaking strength. Using the bobbins from which the metal flanges could be removed, each individual end produced by the 40 mins. carding periods was slipped off, weighed and the mean % variation between ends across the card calculated. The results of these tests are given in Table 6.

Table 6

| Test | Fancy conventional | Fancy re-positioned |
|---|---|---|
| Mean % variation across card .. | 7·8 | 5·2 |
| Ends down/ 100 draws .. | 82 | 66 |
| Count (Y.S.W.) .. | 14·7 | 14·6 |
| Twist (T.P.I.) .. | 10·9 | 10·2 |
| Breaking Strength (gm.) .. .. | 310 | 307 |

It will be seen that the % variation across the card between ends was reduced by one-third when the fancy was re-positioned. From the graphed data this improvement was particularly noticeable on the outside ends of the condenser bobbins and is attributed to the fact that any disturbance of fibre on the swift caused by the fancy is levelled out by the two following workers so the web is in a better condition for splitting using the re-positioned technique.

A comparison of the number of ends down in spinning shows that the decrease in count variation between ends was reflected in fewer end breakages in spinning. These factors alone merit a serious consideration by industry of this new technique. It will be seen that count, twist and breaking strength of the yarns produced under the two conditions were virtually the same and although it was thought that the improved fibre arrangement with the re-positioned fancy would give stronger yarns it was realised that with such a short fibred blend as this particular one, an increase in strength was practically impossible.

In order to determine whether an increase in strength could be obtained if a better class of raw material were used a further trial was made using a blend of 64's scoured, warp-type Australian matchings to which was added 10% by weight of oleine and 10% of 20 skeins woollen threads, cut into 1½ ins. lengths. All the workers on the card, with the exception of those on the experimental swift, were lifted well clear of the cylinder to reduce the opening power of the early part of the machine so any difference in carding caused by re-positioning the fancy would not be masked by the work already performed. The experimental technique was the same as before except that the variation across the card was not assessed and the samples of card web were collected from the tape doffer to compare the thread contents of the two webs. The results in Table 7 from the various tests show that the thread content of the carded web was reduced from 2·5% to 0·9% when the fancy was re-positioned. This difference in thread content was very obvious from the appearance of the condenser bobbins and evidently had a marked effect on the spinning properties of the condensed slubbing because the ends down in spinning were reduced from 84 to 33 per 100 draws.

Table 7

| Test | Fancy conventional | Fancy re-positioned |
|---|---|---|
| % Threads in card web .. | 2·5 | 0·9 |
| Ends down/ 100 draws .. | 84 | 33 |
| Counts (Y.S.W.) .. | 20·7 | 19·9 |
| Twist (T.P.I.) .. | 10·8 | 9·7 |
| Breaking Strength (gm.) .. .. | 367 | 403 |

Although the counts and turns per inch of the two sets of yarn were practically the same it will be seen that there was a slight increase in yarn strength with the new fancy position and it is thought that this was due to an improved fibre orientation in the web fed to the condenser together with a reduced variation in count between the ends. This latter aspect, viz. fibre orientation of the web, is now being investigated.

### Information Obtained from Industry

In the early stages it was thought that this new technique would be equally applicable to both the woollen and worsted industries but it has found much more application in the woollen trade. Nevertheless, two worsted manufacturers have used this technique for more than six months and have found considerable improvement in carding fine, short fibred, French combing types of wool but with the longer Bradford types of wool little success has been reported. The reason for this is not understood but we hope to investigate the problem on our worsted card.

In the woollen industry the most common and successful application of this technique has been to re-position the fancy on the last swift of the carder and a considerable number of firms have been using this idea for nearly a year. A few firms have not been able to make this arrangement perform satisfactorily and in our experience the main reasons for their failure have been the use of unsuitable fancy clothing, an unsatisfactory drive to the fancy and too tight settings on the workers following the fancy. An arrangement which has been found to work very well is shown in Fig. 1 where the fancy is preceded by two workers and followed by two workers on the back swift of a carder. It is interesting to note that the fancy is followed by a fly stripper on this particular machine and although this is not always necessary a number of firms seem to favour its inclusion. The best results so far have been obtained using a "Rotomatic" fancy and the following settings have proved satisfactory.

| | |
|---|---|
| Worker 1 | 26's gauge |
| Worker 2 | 28's gauge |
| Fancy | to penetrate ¼ in. into swift |
| Worker 3 | 20's gauge |
| Worker 4 | 24's gauge |
| Doffer | 26's gauge |

In most cases the surface speed of the fancy has been the same as for the conventional position.

Table 8

| Test | Fancy conventional | Fancy re-positioned |
|---|---|---|
| % Thread content | 0·30 | 0·16 |
| No. of intact threads/gm. | 0.53 | 0·39 |

Whilst most engineers who have tried this new method have been willing to express opinions as to its success, few have facilities for obtaining detailed and accurate information,

Table 9

| Test | Fancy conventional | Fancy re-positioned |
|---|---|---|
| No. of fibres measured | 794 | 1095 |
| Mean fibre length (cm.) | 3·7 | 3·9 |
| Standard deviation (cm.) | 1·7 | 1·7 |
| C. of V. % | 46 | 45 |

which explains why we have carried out so many tests in our department in order to assess the new technique in a more quantitative manner. Nevertheless, we have received some facts and figures from industry. Table 8 is the record of a trial made in one mill using the conventional and re-positioned fancies on the last swift of a three part scribbler. A blend to which has been added 5% of 19 skeins woollen threads, cut into ½ in. lengths, was used and the threads remaining in the sliver after carding were removed and weighed separately and, together with the sample of sliver and the % thread calculated. In addition, any uncarded threads were counted and the number of intact threads/gm. calculated.

It will be seen that although the scribbler had two swifts in addition to the experimental one, the % thread content was reduced from 0·30 to 0·16 and the number of uncarded threads per gm. of sliver was reduced from 0·53 to 0·39 when the re-positioned fancy replaced the conventional one.

A test was made at a second firm to investigate the effect of the re-positioned fancy on fibre breakage and the figures given in Table 9 are the results of a direct comparison between the ordinary and new techniques. It will be seen from this data that the use of a re-positioned fancy does not necessarily bring about any more fibre breakage.

Table 10 is a record of two trials made in another mill using the conventional and re-positioned fancies on the back swift of the carder. It will be seen from this table that the count and twist of the two yarns made from blend 1 were approximately the same yet the breaking strength of the yarn increased from 13·6 ozs. to 16·1 ozs. With the second blend, once again the count and twist were alike yet the breaking strength of the yarn increased from 7·6 ozs. to 8·9 ozs. when the fancy was re-positioned. The increase in strength with blend 1 was 18% and with blend 2 was 17% when the fancy was re-positioned.

A number of advantages gained by re-positioning the fancy on the back swift of the carder have been claimed by industrialists and these are listed below. It is perhaps necessary to state that all these have not been claimed by any one firm, because of the wide variety of blends which have been processed by this method.

Table 10

| Tests | Blend 1 | | Blend 2 | |
|---|---|---|---|---|
| | Fancy conventional | Fancy re-positioned | Fancy conventional | Fancy re-positioned |
| Count | 21·0 | 20·5 | 34·0 | 34·0 |
| Twist (T.P.I.) | 8·7 | 8·5 | 10·0 | 10·6 |
| Breaking strength (ozs.) | 13·6 | 16·1 | 7·6 | 8·9 |

**(1) A decrease in the end-to-end variation across the card. In our own tests a decrease of 33% was recorded but some firms have claimed up to 50% improvement.**

**(2) Webs contain fewer neps or threads.**

**(3) Increased yarn strength except in the case of very short fibred blends, where there is no difference.**

**(4) Better mixing, especially in the production of Oxford shades containing small quantities of white and large quantities of dark fibre.**

**(5) Blends spin to finer counts with the re-positioned fancy than with it in the conventional position.**

**(6) Fewer end breakages in spinning.**

**(7) In view of the increase in carding power obtained by re-positioning the fancy it is possible to reduce the number of swifts in a card.**

**(8) No firm has reported an increase in the frequency of fettling.**


### Acknowledgement

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# *Book Review*

REVIEW OF TEXTILE PROGRESS. Vol. 9; 1957. Pp. 545. Published jointly by the Textile Institute and the Society of Dyers and Colourists (price 42s.).

The latest edition of the well-established review of textile progress follows the broad plan of previous years. It would be difficult to imagine a more competent team of contributors under a committee of such experience in the field of textiles. They have all done their work well according to the traditional procedure which is to make the review an extended bibliography of research papers intended for research workers.

The fact that both the S.D.C. and the T.I. have asked their members to make comments and suggestions concerning changes in style and presentation for volumes subsequent to Vol. 10 indicates the wisdom of the joint editorial committee in considering future plans in the light of past experience.

In general, the review is too long and too dear, many of the sections are unduly long because they contain a mass of detail which is only of interest to those who are active in that particular field of research but would surely have read the papers and abstracts long before the review appeared. The reader who hopes to learn what has taken place outside his own line of work, and who wants to know what is important and what is unimportant, does not receive much help except in a few of the chapters. It would be invidious to name authors, but the fact that interesting and informative accounts of progress can be written should be developed in the future. Furthermore, an author may show his skill and judgment and real knowledge of the subject matter in his *selection* of material for comment; it is neither wise nor helpful to compile a long list of published papers with little more information than is already given in the title of the paper. Perhaps more co-operation between authors and group-editors would be helpful, but the main issue is to determine whether the broad pattern of writing by research workers for research workers should be continued or if the textile technologist should not be given more consideration.

Sixty pages of indexes show the thoroughness with which the review is managed, and those who do the indexing are deserving of our gratitude; dare one hope for a decennial index in due course? It would be of very great value. The characteristically discerning introduction by G. S. J. White, chairman of the joint committee, mentions the quiet and rather unspectacular progress but nevertheless draws attention to manufactured fibres, reactive dyes, the colour index and other matters which are the outcome of the work of the textile chemists. He also mentions the recession in Western industry and the febrile activity of Asia, but if the list of references in the current review is any guide, the research activity of this country is likewise overshadowed by that of our competitors; what can be done to recapture the initiative where once we led the field?

However, returning to the review, as distinct from textile progress, it is most encouraging to know that the committee is anxious to make it of greater value; perhaps the most useful and helpful comment in this context is that the unduly comprehensive treatment, combined with frequent lack of guidance on merit, often tends to produce a classification of matter which is little more than an outline and militates against its general usefulness. It is hoped that authors, editors and committee will experiment further in the thorny path of trying to please everyone.

P.R.C.

# Examinations in Textile Subjects: A Survey and an Assessment

*The writer has been associated with examinations in textile subjects for over forty years. He surveys changes in the type of questions set and the answers required, and discusses problems facing teachers and examiners in their assessment of the value of written answers. In a second article he will offer advice on answering examination questions*

By "TEXTILE TECHNOLOGIST"

EXAMINATIONS will shortly be coming round again for several hundreds of youths (and quite a number of girls) in a whole range of textile subjects. Teachers and students alike in both full and part time classes, are at present preparing for these tests of knowledge, and as the time for the examinations draws nearer, so the tempo (as well as some temperatures!) will rise. Examiners for such bodies as the City and Guilds of London, the Union of Lancashire and Cheshire Institutes, and for certain schools and colleges will have prepared their questions and the aims of the students will be not only to "satisfy" these examiners but also in some cases to reach the standards of the Ordinary and the Higher National Certificates.

### Changes in Questions

It is interesting to note the changes which have taken place in the types of questions in these examinations during the last forty or fifty years, not only in relation to changes in mill processes but also in relation to changes in the viewpoints of educationists. Naturally the questions have kept pace with technical progress and in doing so they have ceased to be applied to machines and processes which were becoming obsolete.

Today, for example, there are never any questions about the action of the "porcupine feed table." On the other hand, fifty years ago there were few if any questions on "artificial silk," or on "high drafting" and "short processing." There were questions on automatic looms, but very few on the adapting of the non-automatic loom for "more looms per weaver." Today there are questions on the properties of man-made fibres, on automatic winding machines, on shuttleless looms and on dyeing and finishing techniques which were not thought of half a century ago.

### Fundamental Questions Unchanged

Of course, there remain the "fundamental" questions—those dealing with the basic processes—and these are essentially the same today in content and often in actual phrasing as the early ones. The arrangement of fibres in yarns, the action of the carding machine, the "cycle of operations" (a phrase beloved by examiners) in the mule, the motions of shedding, picking, and beating up in the loom—all these, if they are not hardy annuals, at any rate make very frequent appearances in examination papers.

Generally these fundamental questions are expected to be answered in the time-honoured manner, although sometimes additional information is nowadays available, and is given in answers, which has resulted from laboratory research rather than from known mill practice. In particular, the vastly increased knowledge about the physical and other properties, not only of the newer fibres, but also of the natural fibres, has meant that the answers of earlier generations of examinees would not satisfy the examiners of today. Again, much more attention is now given to the costing of individual processes, to testing, including the determination of the significance of test results, to quality control and of course to work study in all its aspects.

### Trend Towards Broader Views

But apart from differences in the questions arising from new information and new techniques, a careful study of past and present questions shows a significant trend away from detail and towards broader views. Presumably students are not now expected to have the exact and detailed knowledge of mechanisms, for example, as they had in the past. Many of the questions then could only be answered thoroughly by those who had memorized the details either from books, or in the classroom, or by actual experience in the mill.

There were questions on the mule, for example, concerned with the shaping of the cop, which were well answered on the whole, but which one feels today would be largely evaded. Admittedly the mule is being replaced by the ring frame, even so questions are still asked about the mule, but they are not nearly as detailed as they were. Again, to "describe how you would erect a roving frame" (a question asked some fifty years ago) is scarcely the type of question which would be asked today.

### Memory or Reasoning?

This tendency towards the avoidance of questions asking for detailed information is also coupled with a reduction in the number of questions asking for information which in the main is "memorized." It is probably associated with a desire on the part of educationists for more questions requiring a measure of "reasoning" to answer, and for questions dealing with the "science" or "scientific basis" of the subject.

This is not the place to discuss fully the relationship between this "science" and earlier or even present-day ideas on textile processes. The scientific knowledge available on these processes is based on experimental

results, and is of course growing, sometimes superseding, sometimes clashing with, and sometimes confirming preconceived ideas. In subjects like testing, in fibre structure, in the processes of making fibres and in dyeing and finishing, scientific knowledge is paramount, but is it possible to set many questions dealing with the scientific bases of the processes of spinning and weaving? Indeed, is it also possible to provide many questions on these subjects which require deductions and reasoning to answer? For they are subjects in which mechanisms are the principal features, and these of course involve descriptions based on memory.

A question such as "Describe the operation of a cotton beam warping machine," for example, requires a description based on memory. A question like, "What are the advantages and disadvantages of warping from cones compared with warping from bobbins?" might on a first consideration be classed as one requiring an answer based on reasoning. But is this the case in practice? Is it not very probable that nearly all the answers would be based on memory—on what the student was told about the subject in class?

### Some Details are Important

Reverting to the trend towards a "broader outlook," with less emphasis on detail, there are indications that the swing is going too far. Certainly many of the earlier questions required so much detailed knowledge that it is doubtful if they could be answered at all by the present generation of examinees, and the fact that there is no longer any need to "swot up" such detail in order to pass examinations is a step forward. But are students becoming so obsessed with this tendency that they are becoming too vague and hazy about *important* details? (many mill managers would say that attention to detail is the essence of good management—"anybody can see the big things.") Quite recently several candidates at a spinning examination stated that the mule quadrant moved upwards to a vertical position as the carriage ran inwards, whilst the candidate who described a sley as "a lump of wood' and left it at that, was certainly carrying the idea of ignoring detail too far!

### How Reliable are Examinations?

How do the answer papers of today compare with those of earlier years? In the writer's opinion, the preliminary grades show no improvement in the quality of the answers. There are still too many badly expressed answers, with sketches like nothing on earth, all indicating an abysmal ignorance of the subject. In the advanced grades, however, the standard of work is definitely higher than it was twenty or thirty years ago.

One of the weaknesses of most written examinations, however, in so far as they are meant to test the ability and knowledge of the examinee, is of course due to the fact that some students have an aptitude for expressing themselves in written words, whilst others are almost without any facility in this direction. The difference may be due to education, or to the kind of work they are engaged in, or to something inherent in them, or to all three combined. In technical subjects such as are being discussed here, the difference between the two types of examinees is much more than in say commercial subjects. For the examinees are mainly mill workers with practical experience and knowledge, but with little training in the art of expressing their thoughts on paper.

### Types of Examinees

Compare, for example, the youth in the mill, say a piecer or a weaver, with a youth in the mill office. The latter, accustomed more to the written word, will probably answer many of the questions more intelligently than the mill worker, yet in many cases the mill worker would be able to *do* the work covered by the question, and therefore would know more about it, than the office worker with higher marks for his examination. Conceivably, even in the example quoted earlier (how to erect a roving frame) a sharp-eyed office boy might make a better "go" of describing this job on paper, in terms of general principles, than the attentive but somewhat stolid apprentice who helped to do the work.

Another class of candidate is now present at examinations who was almost non-existent fifty years ago—the laboratory assistant in the mill. He is probably in a better position for passing examinations than either the mill worker or the office worker. For he will almost certainly be well able to describe things on paper, he will be more familiar with machines than the clerk, and he will of course be particularly strong in his knowledge of testing equipment and techniques.

Hence this inherent unfairness in most written examinations is much more evident in these technical examinations. It is a pointer to the fact that the examinations are only one facet of an individual's make-up, and so far as general ability, and the qualifications for a job are concerned, every employer knows that there are several other sides he must examine when considering applicants for a vacancy.

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# Prospects for Wool in 1959

After passing through a difficult phase during 1958, there are encouraging signs that the world wool industry may experience better trade conditions during 1959, writes the I.W.S. trade correspondent in Bradford. The most hopeful indication is that, in several of the chief manufacturing countries, the decline in the rate of wool consumption, which persisted during the greater part of the year, was arrested during the later months and in some instances, reversed. Final figures for the year will not be available for some time, but the later months of 1958 revealed an upward turn in activity. This was especially true of the U.S.A., where the recession was the first to set in and wool usage has shown a particularly sharp decline. By October last, however, a sharp rise of 17% was recorded on the corresponding month of the previous year, and there is reason to believe that the improvement has been substantially maintained.

In a more modified form, the same trend was seen in the U.K. during October, and as the U.K. uses more wool than any other country and is the world's largest exporter of wool products, particular significance attaches to the experience of this country. West Germany and Italy are also showing better figures than a year earlier although, among the principal manufacturing countries, signs of improvement are still awaited in France and Japan. Although world consumption of wool has been running throughout the greater part of 1958 at an average level about 14% below that of the previous year, the offerings of Commonwealth wool which came on to the market last September have been moved with great freedom. As the second stage of the selling season is about to open, only normal quantities await disposal during the second half. Wool values have reflected the easier trend which has characterised most commodities but, at the outset of the New Year, they are considered to be at an attractive level and one calculated to encourage commercial operations. In most qualities, they are well below the average level for other commodities, and the relative stability which they have displaed at public auction in recent weeks is steadily promoting that confidence which is essential to sound business.

# Recent Developments in Shuttle-less Looms*

*Brief constructional details and operational features of some of the most recent models available to manufacturers*

By V. DUXBURY†

IT is important to establish the difference between a shuttle-less loom and one with stationary weft supply only. In the former, the weft thread only passes between the warp shed lines, whilst in the latter some form of weft carrier would be permissible. It might not necessarily have the form of a conventional shuttle but in all cases the weft supply would be located outside the edges of the cloth.

The Sulzer weaving machine, installed in mills in this country, on the Continent and in America, is available in two widths, 85 and 130 ins., weaving at 280 and 210 p.p.m. respectively. In some instances, the full reed space is used to produce one width of cloth, e.g., sheetings. In other cases, two or three widths of cloth may be woven in the same machine simultaneously. Weft is supplied at the left-hand side of the machine only and is fed to a small gripper shuttle measuring approximately $3\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ ins. and weighing about 1·4 ozs. The rear end of the shuttle has a spring steel jaw which is opened mechanically to allow the end of the weft supply to be inserted and firmly held when the spring is allowed to snap shut. This shuttle is picked from the left-hand side of the machine and on reaching the right-hand side, the weft is released and the shuttle returned to the left-hand side by a conveyor situated below the warp. Its speed of return is much lower than its weaving speed, consequently a whole series of gripper shuttles is employed, but of course only one is picked through the shed at any one time.

The method of picking is by torsion bar. The bar is strained by means of a rotary cam, and upon release the strain energy causes a short picking stick to move through a relatively small arc and strike the shuttle on one corner of its rear end. the shuttle follows a fixed path across the loom by a series of guides, elevated just before the pick begins, and which fall below the bottom shed line just before beat-up. Picks are inserted singly and after each pick the weft is cut close to the left-hand selvedge. The tails, approximately $\frac{1}{2}$ in. long, are tucked into the next shed at both selvedges. If more than one width of cloth is being woven, then a cutting and tacking unit is placed between the various cloths for selvedge forming. The yarn is withdrawn intermittently from the stationary supply package and the high gripper speed of about 70 ft./sec., requires a weft withdrawal speed of the same order. Certain difficulties can arise with some types of yarn. The loom is available for weft mixing, withdrawing weft from two cones alternately.

A similar method of weft withdrawal is represented by the Aspden attachment fitted to John Pilling and Sons Ltd. looms. In this case there are weft packages at both sides of the loom supplying weft alternately. A specially designed shuttle picks up a loop of weft by means of a hook and inserts a double pick in each shed. Although, because of the loop of weft, withdrawal rate is high it is little different from the Sulzer, since the shuttle speed is only about half that of the Sulzer gripper shuttle. The "Tumack" loom built by James Mackie and Son Ltd., Belfast must also be mentioned. This has a rapier type of weft insertion and it is claimed to run at 380 p.p.m., weaving cloth 64 ins. wide. So far, it is applied only to the weaving of jute cloth.

Considering now the truly shuttle-less type, the most advanced are the Maxbo and the Kovo. The latter weaves cloth about 18 ins. wide only, but speeds in the region of 800 p.p.m. are claimed. However, my information is that no more are being made for the moment but that further developments are expected. Whilst Maxbo and Kovo both employ compressed air, it is interesting to note that Kovo have shown a loom weaving more customary widths of cloth by means of a water jet weft insertion. Whilst this has been claimed to be suitable for the hydrophobic fibres, this also is apparently out of production.

The Maxbo jet loom, installed in the Textile Department of the Manchester College of Science and Technology, has been in operation since April, 1958. The inventor, Mr. Max Pääbo, an Estonian by birth, went to Sweden as a refugee some time around the end of the war and developed his loom in that country. The loom at the college runs at 310 p.p.m., weaving cloth just less than 36 ins. wide. Mr. Pääbo contends that he can go wider but he considers that the limit is around 48 ins. The loom shown recently at Belle Vue was operating at 420 p.p.m., but although single picks were being inserted, the shed was arranged to stay open for two consecutive picks. Thus the heald shafts were only changing 210 times per minute as against our plain weave 310 times per minute at the college. It is interesting to note that limiting weaving speed appears now not to be the speed of the shuttle but the speed at which a shedding motion can operate.

### General Description

In its present form the loom consists of a simple cast iron framing with a fixed flange warp beam located at the back. The warp sheet passes vertically upwards to the back rest, which approximates to that of a conventional loom, and from there is taken upwards and over the top tension roller, which is approximately 5 ft. above floor level. The yarn is then passed over the front guide roller with the warp stop motion located midway between the top tension roller and the front guide roller. From guide roller, the yarn makes an angle with the vertical of approximately 15° and is then drawn through the healds, the heald frame ends being mounted in slides which make an angle of about 15° with the horizontal. The reed immediately below the healds has its metal baulks located in the top and bottom reed cases fastened to the slay by setscrews spaced at regular intervals along the slay. A baffle plate is fixed to the front of the reed and a corresponding plate at the back completes the triangle, the base of which is the reed and the sides the baffle plates. It is through this triangular space that the air jet and pick of weft are directed. The front and back baffle plates are respectively parallel with the top and bottom shed lines and thus conform with the shed angle. Quick release temples are fixed to the loom framing and the cloth passes around guide rollers and take-up roller, around two more guide rollers and on to cloth roller, to be wound by frictional contact with take-up roller surface.

### Driving and Shedding

The drive to the loom is by three V-ropes from a 2 h.p. motor to the main driving pulley at the left-hand side of the machine. The main drive shaft, together with various counter shafts, shedding cams, drive for slay and compressor are totally enclosed in a sealed housing. A 13 ins. dia. hand-wheel is situated on the left of the housing. Oil circulates in this gear box by means of an oil pump driven by an auxiliary belt from the motor pulley and a conventional oil filter is inserted in the line.

Positive cams are driven from the main shaft by cut gears suitably compounded for changes of weave up to and including four shafts in early models, and eight shafts in later models. Anti-friction rollers are operated by the cams and are carried by push rods which have at their

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* *From a paper given recently to Derby Textile Society.*

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opposite ends locking nuts to couple them to short, inclined levers which, in turn, are setscrewed to the heald driving rollers. Up to this point the assembly described is totally enclosed but the heald driving rollers extend beyond the housing across the full width of the loom. The heald driving rollers carry levers which are coupled directly to rigid extensions connected to the base of the heald frames. The cams are designed to give open shedding with virtually simple harmonic motion of the heald shafts without dwell. Slides in the loom frame restrict lateral movement of the heald shafts as in conventional low-built looms.

### Picking

The weft thread is impelled in measured lengths by a jet of compressed air (12 lbs/sq. in.) from a nozzle situated to the right of the main shaft housing. The compressor, driven by a crank and piston from the main shaft, draws its supply of air through a simple air filter on the downward stroke of the piston and expels the air on the up-stroke. The compressor is connected by a rubber hose to the nozzle and no valves are required. A secondary tapping from the compressor leads off a small amount of air to a reserve chamber to which is connected a pressure gauge. The object of this reserve is to facilitate threading of the nozzle in the event of a weft break. Light finger pressure on the emergency valve allows air to escape from the reservoir into the main air line to the nozzle should re-threading be necessary. The stream of air with the measured length of weft passes through the channel formed by the reed and the baffle boards and at the right-hand side of the loom enters the orifice of a vacuum tube. In commercial practice, this tube would be connected together with those from several other looms to a central vacuum pump and a waste collecting bag. In the individual loom the vacuum pump is fitted to the rear of the loom as an attachment and driven from an auxiliary pulley on the motor with a waste collecting bag almost like a household vacuum cleaner.

The weft is taken from a stationary supply package at the base of the loom at the left-hand side and led upwards through a guide eye. It then passes underneath a nylon tension wheel, over the surface of a measuring drum and through a guide eye at the centre of the drum and into the nozzle. The measuring drum rotates at constant speed and makes three revolutions for one pick. Its circumference is slightly greater than one third of the reed space. In the surface of the drum and towards its right-hand end, a hole $\frac{1}{8}$ in. dia. allows the tip of a needle to protrude $\frac{1}{4}$ in. for just less than three ($2\frac{1}{2}$) revolutions of the drum and to be withdrawn by cam action for the remainder of the third revolution. This coincides with the point at which picking takes place and the coils of yarn on the drum are able to slip off and through the nozzle. The needle is then extended to resume the winding-off operation.

On starting, the tension wheel is placed in the inoperative position by a hand-operated spring-loaded lever. After two or three picks have been inserted, the wheel is lowered on to the weft and frictional contact between tension-wheel and measuring drum controls the length of weft wound off and prevents excessive waste. The situation immediately after picking is a length of weft stretching from supply package over measuring drum, through nozzle, across the warp and into the vacuum orifice. The needle in the measuring drum is then extended to recommence winding, whilst the remainder of the cycle of operations takes place. This takes the form of (*a*) weft tensioning; (*b*) weft tension compensation and (*c*) weft cutting and (*d*) weft re-location in nozzle. The mechanism for controlling these operations is the tension finger situated between measuring drum and nozzle and in its initial position slightly above the taut weft thread. It appears as a round steel finger about 5 ins. long and $\frac{1}{4}$ in. dia. with a hollow stem $\frac{1}{8}$ in. dia. driven at its base by a cam on the extension of the main shaft and caused to move in the arc of a circle, the movement being represented diagramatically in Fig. 1.

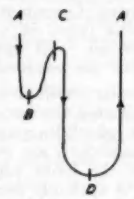

Fig. 1

Simultaneously, a gear wheel on the main shaft, meshing with a wheel on the tension finger shaft, causes an internal cam in the base of the finger to operate a needle located in the hollow stem of the finger. The needle is withdrawn at positions (*a*) and (*d*) and remains thus from (*d*) to (*a*) as the finger returns to starting position. However, from (*a*) to (*d*) through (*b*) and (*c*) the needle is extended $\frac{1}{4}$ in. beyond the tip of the finger. This means that in its downward movement to (*b*) the extended needle makes contact with the weft thread, reducing the length of weft in the suction nozzle at the right-hand side of the loom and applying uniform tension to the pick of weft in the open shed.

The reed now descends to beat-up position but slightly in advance of the cloth fell and at the right hand side of the loom, a spring loaded nylon plunger notched on its upper surface makes contact with two stout wires (almost like reed wires) fixed to the slay. The weft is thus trapped and held at this point. Returning to the left hand side of the loom: the tension finger having tensioned the weft in moving to (*b*) must relieve some of the tension as the reed moves to beat-up position. This is done by moving the finger (needle extended) to position (*c*). No disturbance can be caused to the weft by the air suction at the right-hand side, since the weft is trapped between plunger and reed. The length of weft extending from selvedge to nozzle at the left-hand side, and from selvedge to plunger at the right-hand side, now passes between the opened blades of the tungsten carbide tipped scissors, one pair at each side of the cloth. Cams on the main shaft close the blades and the weft is severed at both extremities.

The return movement of the reed releases the short piece of weft trapped at the plunger at the right-hand side and this is sucked away into the waste bag whilst at the left-hand side the tension finger completes its movement to (*d*) and pulls back into the orifice of the nozzle the starting end of the following pick. The finger returns to position (*a*), this time with the needle withdrawn. This is essential, since the needle must not contact the strand of weft stretching from winding-drum to nozzle. This completes the cycle. A uniform fringe of weft about $\frac{1}{4}$ in. long is formed along both edges of the cloth and approximately 1 in. of yarn is carried away as waste at the right hand side of the loom each pick.

### Selvedge Motion

Two drums, one at each side of the loom are responsible for forming the outside edges of the cloth. Each drum holds two diametrically opposed flanged spools, on to which is wound a good quality selvedge yarn. The drums are driven by chains and sprockets from the main shaft and rotate in opposite directions. Each drum makes one revolution in two picks and locks the weft thread by reason of twisting around it.

One or two other points might be mentioned. The design of the jet and the pressure used means that air issues from the jet orifice at about 1,200 ft./sec. The average speed of the weft is about

$$\frac{38{\cdot}5}{124} \times \frac{360}{70} \times \frac{310}{60} = 84{\cdot}4 \text{ ft./sec.}$$

Taking the initial weft velocity at twice this value, it is obvious that the thread must encounter considerable resistance to its motion.

Certain criticisms have been made concerning loss of twist in the yarn during weaving but our investigations to date show no significant difference. Comparative noise level tests have been made with the Maxbo loom and with a Northrop loom the former running at 310, the latter at 210 p.p.m. A mean value of 80 decibels was recorded for both looms, but whereas the Maxbo emits a more or less continuous sound, the conventional loom has intermittent peak values at picking and checking.

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### Wool Textile Trade with Argentina

Advance B.o.T. information affecting future business with the Argentine, following currency and other changes in that country, is circulated by the National Wool Textile Export Corporation with special reference to wool textiles. After mentioning that the recent multiple exchange rate system is to be replaced by a single fluctuating free rate of exchange, when dealings are resumed, the statement says that Argentine imports are to be freed from quota restrictions but will face a market which has been subjected to austerity by deflation; there is to be a surcharge system on imports. Essential goods will be admitted, some free of surcharge and others on payment of 20 or 40%. Other goods, "including almost certainly wool piece goods and possibly yarns," are expected to be subjected to a surcharge of 300%. It is understood that goods already on the way to Argentina and not cleared through customs will be surcharged and present information suggests that appeals against surcharges will have little chance of success. Before the war, Argentina was a major importer of wool cloth and yarn, but U.K. exports of wool textiles to that country in 1957 had fallen to about £118,000.

# Scientific Methods of Control in the Textile Industry

SOME of the benefits which have accrued to the textile industry from the introduction of science into what was traditionally a craft-based industry were described by Mr. L. H. C. Tippett, an assistant director of the British Cotton Industry Research Association and president of the British Association of Textile Works Managers, in a recent address to the Bolton section of the Textile Institute. After calling attention to the remarkable improvements in operative working and welfare conditions, Mr. Tippett turned to the widespread developments in instrumentation and control. From the B.C.I.R.A. alone there were now over 30 instruments and devices available to the industry covering raw material testing, yarn properties, yarn preparation, weaving, and finishing. Fibre measurements that were now made as a routine in textile processing included length distribution, fineness and maturity, strength, and trash as estimated by the Shirley analyser. Moreover the developmentof the science of fibre measurement had contributed fundamentally to the work of the plant breeders in producing and maintaining the quality of new and improved varieties of cotton.

In spinning, setting gauges, count balances and lea-strength testers had long been used and nep counting devices were coming into use but the most important development here was the measurement, analysis and control of sliver, roving and yarn irregularity. The control of tension in yarn preparation had received special emphasis with the expanding use of man-made fibres, whilst in sizing the use of scientific techniques had wrought a minor revolution.

Analysis at the sizing stage now included the amount of size and moisture on the warp, and these, with the sizing materials, were now controlled so as to produce the best possible weaving performance. Indeed, largely owing to the techniques and instruments devised by the Shirley Institute (such as the Shirley automatic size box and the Shirley Ampli-Dry), cotton warps today were giving better weaving at lower costs and under better operative conditions than ever before.

In weaving cloth, measuring devices and line-gratings had added precision to traditional control methods while tests now in current use enabled the manufacturer to exercise greater discrimination in his choice and acceptance of yarn. Likewise setting gauges (such as the Shirley loom gauges) had brought the possibility of a welcome standardisation to loom overlooking. Control in finishing now covered bleaching, dyeing, printing and all the various "performance" finishes. The assessment of finished fabrics for such properties as stiffness, thickness, hardness —properties embraced by the term "handle"—were now performed by instruments.

Mr. Tippett concluded: "In my view more scientific control is inevitable. New fibres and other raw materials are being introduced at a great rate and they have to be processed. In order to determine the best conditions there is not time for the long process of unsystematic trial and error and the gathering of experience that is characteristic of the craft approach even where that approach could be successful.

The same applies to the many new finishes and products that are constantly coming forward. Customers of the industry are becoming more exacting in their requirements and this requires closer control of quality which, in its turn, requires the application of scientific methods. This applies particularly to industrial consumers many of whom, being used to supplying and receiving industrial goods made to engineering specifications, are inclined to demand the same sort of thing from the textile industry. Scientific control is the very basis of many industries and is gaining ground in others; the textile industry cannot insulate itself from the general trends in the country. The textile industry of the future is now widely envisaged as being smaller in size than at present, but more efficient. I think that an increased use of scientific controls will be an essential ingredient of that efficiency."

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# High Temperature Sample Dyeing Unit

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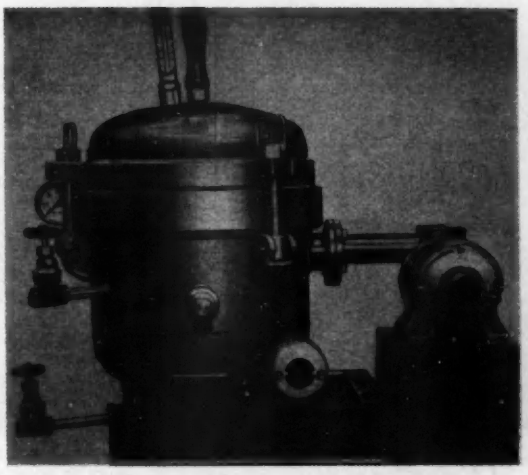
Longclose Engineering Co. Ltd., Crescent Works, Dewsbury Road, Leeds 11, will gladly supply full details on request.



**The new Longclose high temperature 8-beam laboratory unit**

# Anti-Static Agents in the Textile Industry*

*Evaluation of anti-static agents, measurement of charges on yarns, and anti-static action and chemical structure*

By A. E. HENSHALL†

ELECTROSTATIC charges are readily generated on fibres of low moisture content and high electrical resistance and are very prone to occur during textile processes such as spinning and weaving. The static electrification of textiles may be controlled by various methods, of which the most effective and convenient is the use of anti-static agents or dressings. These are usually surface active agents. The mechanism by which they function has not been established with certainty. It is known that they are hygroscopic and effectively reduce the electrical resistance of any surfaces to which they are applied, thus enabling any charge generated rapidly to leak away. They can also reverse the sign of the charge and it is probable that they can modify the charging process itself.

## Evaluation of Anti-Static Agents

For the evaluation of anti-static agents, it is important that test conditions are standardized as carefully as possible.

*Fabric Static Measurements.*—The preliminary testing is most conveniently done on fabric using the technique described by Hayek and Chromey (Amer. Dye. Rep. 1951, **40**, 164) and Earnshaw (Hexagon Digest 22 Oct., 1955). Anti-static processing aids, in addition to their anti-static effect, should preferably have other desirable properties, as well. They should:

(1) Not adversely affect processing performance.
(2) Be non-corrosive to metals and machinery.
(3) Provide adequate lubrication for the process for which they are intended.
(4) Be readily removed from the fibre by simple aqueous treatments.
(5) Be free from ageing.
(6) Function effectively at low humidities.
(7) Have no effect on the shade or fastness properties of dyestuffs.
(8) Preferably be of liquid form.

In practice they are usually selected on the basis of their suitability for a particular application.

Some idea of processing performance can be gained by small scale carding trials in which the treated fibre is carded on a machine such as the Shirley miniature card. The charge on the sliver is measured by the Faraday ice pail technique described by Keggin, Morris and Youle (J. Text. Inst. 1949, **40**, T702).

In addition to static measurements the overall carding performance can be assessed, particularly any tendency to card loading. Card loading is the tendency of the fibre to bed down in the card clothing and choke up the card and is particularly troublesome with the finer deniers. All known anti-static agents can cause loading if applied at sufficiently high concentrations, but some are worse than others. Card loading does not normally occur when static is present. In practice it is usually found that as the concentration of anti-static agent is progressively increased the charge on the fibre diminishes until finally it disappears completely. At this concentration there is little or no loading, but on further increasing the concentration, perhaps over a relatively wide range in the case of a good agent, the onset of loading becomes evident. Ultimately, it can become so severe that carding is impossible.

## The Measurement of Electrostatic Charges on Yarns

In the laboratory the anti-static properties of yarns may be tested by running them over a suitable "rubbing surface" which can be an insulated metal peg connected to an electrometer. Alternatively the charge on the yarn itself may be measured after rubbing. Commercial instruments such as the "Emell Electrometer" are available for this purpose.

## Resistance Measurements

Since anti-static agents appreciably reduce the electrical resistance of fibres, resistance measurements have been suggested as means of evaluating anti-static agents. They require very great care and specialized apparatus, since the resistance to be determined is frequently of the order of $10^9$ to $10^{12}$ ohms. Resistance measurements on yarn can be made by winding the yarn on to a suitable former and placing it in a suitably humidified enclosure; the resistance of the yarn is then measured with an instrument such as the Electronic Instruments "20 million megohmmeter." The resistance of yarn treated with an anti-static agent usually attains equilibrium with the surrounding atmosphere within 30 mins.

## Anti-static Action and Chemical Structure

A wide range of anti-static agents, both durable and non-durable, and of widely differing chemical constitution has been tested. They were all hygroscopic and adsorbed or desorbed water until they were in equilibrium with the atmosphere. To determine whether hygroscopicity and resistance measurements can be used as criteria of anti-static behaviour, three typical compounds were examined, namely,

(1) Lissapol NX, which is extensively used as an anti-static agent.
(2) Polyethylene glycol 300.
(3) Glycerol.

Glycerol and polyethylene glycol 300 are known to be very hygroscopic.

The results showed that glycerol and polyethylene glycol 300 were much more hygroscopic than Lissapol NX, and that the resistance of yarn treated with PEG 300 was of the same order as that treated with Lissapol NX, but glycerol was inferior in this respect. In anti-static performance Lissapol NX was markedly superior to the rest. Some improvement in anti-static behaviour could be effected by the addition of an ionizable material such as caustic soda to the glycerol and PEG 300, but Lissapol NX was still superior, particularly at low humidities.

Resistance measurements alone should not be used for evaluating commercial anti-static agents because any ionic impurities present, due for example to residual catalysts used in their preparation, can cause significant changes in resistance which are not necessarily reflected in an improved anti-static effect, and can completely swamp any differences due to chemical constitution. In addition the rate of charging of an insulator is not necessarily related to the resistance.

Anti-static agents are believed to function not only because they are hygroscopic and reduce resistance but because of their orientation on the fibre. Although the resistance of nylon and "Terylene," in common with many insulators and semi-conductors, decrease with increase of temperature, anti-static agents still further reduce it even at elevated temperatures, so that they can be expected to function during high temperature operations such as heat setting.

## Heat Ageing

Anti-static treatments deteriorate after prolonged storage or heating. It has been confirmed that heat ageing is due to diffusion of the agent into the fibre. This was established by:

(1) Extraction of the agent from the fibre followed by re-application of the extract, which restored the anti-static effect.
(2) Analysis, which showed that the quantity of agent on the fibre is unchanged after heating.

**Summary of a lecture to a joint meeting of the Midland Section of the S.D.C. and Nottingham Textile Society.*

† *I.C.I. Ltd.*

# Efficient Handling of Textile Loads

*A materials handling engineer looks at the textile industry*

By W. BYE, B.Sc.

THE manufacture and processing of textiles are, of course, the preserve of the textile engineer, but the operation of a mill embraces many aspects which it has in common with any other factory, whether it makes cloth or cars, socks or steam engines. Such matters as personnel management, water supply and heating are important in their own right and deserve expert attention. Another such factor is materials handling, for no matter what a factory is engaged on, goods have to be brought in, moved through the works and despatched again. Often the responsibility for materials handling falls to the works manager, or one of the department heads, but if the volume of goods handled is large enough, a specialist may be called in to take charge.

It is, however, an error to think that, as far as handling is concerned, all goods are the same and that the same technique can be employed in all factories. Especially in the textile industry, close co-operation between those responsible for the fabrics and those in charge of their movement is essential, both in devising the methods of handling and in their application. A good example of such co-operation is afforded by the simple yet effective method introduced at the Abbey Meadow Mills at Leicester, which form part of the Wolsey Group and are big commission dyers of yarns, hosiery and knitwear.

### Special Requirements

The first consideration in selecting suitable handling means for this mill was the fact that there is no fixed flow of material. Incoming goods range from raw spun yarn for processing, to knitted garments for finishing. Facilities at this mill include scouring, milling, dyeing, drying, steaming, shrinking, pressing, raising and many other processes, which are applied as required. It is therefore not possible to use conveyors, which are normally the simplest means of moving large quantities of goods between fixed points. The only system providing the full flexibility required is the truck and pallet combination. The pallet, in effect a large tray, is loaded with goods and carried about the works wherever necessary by a truck designed to raise the pallet only a few inches off the ground and to manoeuvre it in safety.

Such a system usually also comprises a fork lift truck, which can raise a pallet between 10 and 15 ft. high, stacking one load on top of another. In this way, storage space is utilised to the full extent, while maintaining immediate access to every pallet load. In this case, however, a fork truck was not purchased, partly because the mill, being concerned with processing, never holds large stocks and space is available to store through-going goods on the floor, and partly because the soft and irregular nature of the loads would make stacking difficult, as can be seen from Fig. 1. If, as a result of expansion, stacking in several layers becomes advisable it will be necessary either to adopt box pallets instead of the flat pallets at present used, or to build racks in which the present type of pallet load can be deposited.

A further consideration in the choice of truck to be used was the sensitivity of some of the processes carried out to chemical contamination. Diesel or petrol exhaust fumes might affect the purity of colours, quite apart from being unpleasant to the workers. The choice was therefore narrowed to electrically operated trucks and, after extensive trials, the PP 230 model pallet truck made by Lansing Bagnall Ltd., Basingstoke, was selected.

### Compact Truck

This truck has a nominal capacity of 3,000 lb., although it has been found in practice that on a good floor it can handle up to 35 cwt. with ease. It consists of a driving motor and electric batteries, housed in two shallow compartments at one end, from which the forks extend. These can be of any required length, from 30 to 60 ins., depending on the size of pallet to be handled. Forks of 42 ins. length were selected and a pair of 12 ins. extension pieces were purchased so that, if required, 40×60 ins. pallets can be handled. As can be seen from Fig. 2, the little truck can cope with such large loads without difficulty. The battery and driving compartment do, in fact, add only 17¾ ins. to the length of the forks and the makers claim that this is the smallest truck of its kind in the world capable of dealing with 3,000 lb. loads.

With a width of less than 29 ins. and a steering radius of 200°, the truck has been found capable of manoeuvring its often bulky loads in and out of the various

Fig. 1. Goods of every type, shape and size can be handled on flat pallets by this Lansing Bagnall electric pallet truck

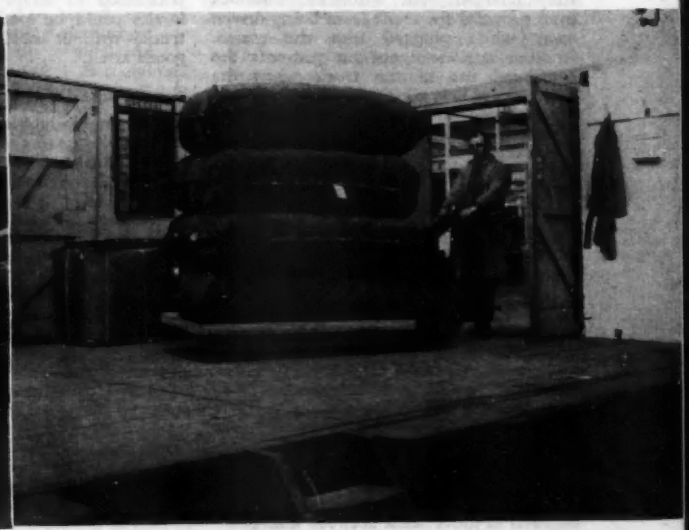


Fig. 2. With batteries and drive motor only 17¾ ins. deep, 40×60 ins. pallets can be handled with ease, in loads up to 3,000 lbs.

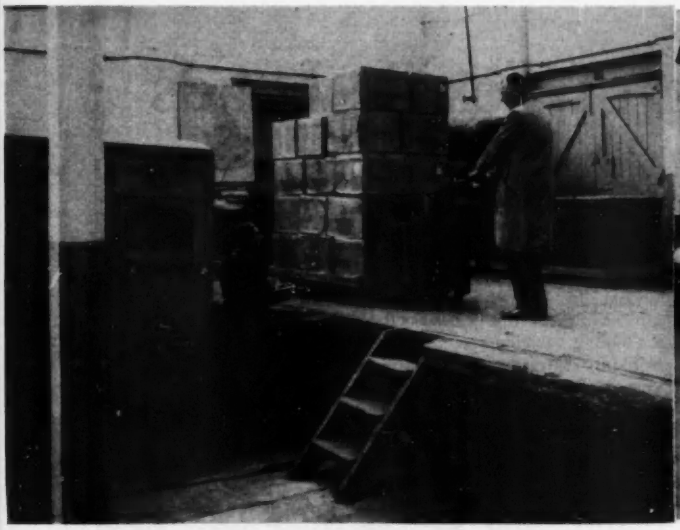


Fig. 4. Thirty cartons are here loaded by truck in the time it used to take to load a single carton by hand

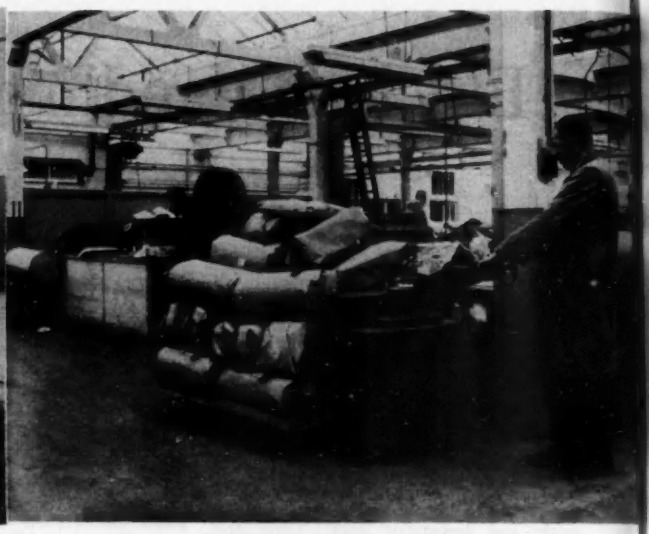


Fig. 3. Palletised transport between weighing and packing sections has reduced despatch times considerably

plants. The speed is controlled by a spring-loaded push-button on the steering handle, which also applies the brake when pushed either up or down. The push-button is spring-loaded into the "off" position and the handle into the vertical braking position, so that the truck automatically stops if the operator inadvertently releases the handle. Operation is so simple that no damage or injury due to the truck has occurred.

Apart from routine maintenance, the truck requires practically no attention. With a fully charged battery, it can work continually for a whole day. In the evening it is simply plugged into an electric mains point and is recharged overnight by a built-in charger, so that it is ready for another day's work in the morning, an automatic cut-out shutting off the current when the batteries are fully charged. An automatic interlock even prevents the truck from being driven away while plugged into the mains. Another automatic cut-out prevents the continued use of the truck when the batteries are low, which would be harmful. These features are of considerable importance in the textile industry, where the operator is not likely to be a mechanic capable of looking after a petrol engine.

### Varied Duties

Despite the fact that only one PP 230 truck was purchased and although the works cover a considerable area, it has been found that the truck can cope with all movements of goods. Its main task is to run loads from the marshalling area near the lorry bay to the various departments for processing, and to bring processed goods back to the area for eventual despatch. When a lorry arrives, the truck is switched to the short shuttle run between the loading bay and the marshalling area, to load or unload lorries as quickly as possible. When not required for either of these duties, the truck is used wherever required to move loads between machines, or from the plant to the packing and weighing department.

In all these duties, the time required to move a given amount of material, be it wool, fabric or garments, has been quite considerably reduced. Fig. 3, for instance, shows a load of packed goods being run from the packing benches to the scales for a final check. This load comprises 36 packages, which were all moved in a single journey, instead of in two or three trips with a sack truck. The checker takes the packages from one pallet and, after weighing them, places them on a second pallet, so that the whole load can again be moved in a single journey to the marshalling area for despatch.

Similar considerations apply to the lorry loading bay. Unfortunately, most goods are received and must be despatched unpalletised, since the truck and pallet system has not yet been adopted by suppliers and customers. If all firms could be persuaded to adopt the use of pallets, lorries could be loaded directly with the truck, without need to manhandle the goods at all.

### Standardisation Needed

In some industries the use of pallets is so widespread that a pallet-circulating system can be adopted. British Railways, and Road Services too, are encouraging the use of pallets by granting special concessions to palletised goods, since their handling is considerably cheaper in terms of manhours than that of unpalletised goods.

The load shown in Fig. 5, for instance, can be deposited by one operator on a lorry in less than a minute, whereas it would take him about 20 mins. to move the cases individually by hand. Experience at other works has shown that to load a lorry by hand takes about ten times as long as to load it with a pallet truck; with heavy goods the savings in time may be even greater. With a bridge plate between the lorry platform and the loading bay, the truck can run straight on to the lorry, to load or unload it in a matter of minutes. Apart from reduced handling charges, the turn-round of lorries is considerably speeded up and their utilisation factor is increased. Calculations have shown that with fully palletised transport, two lorries can cope with the transport of goods for which five lorries must be employed if the same amount of goods is manhandled.

Given fairly constant utilisation, it is no exaggeration to say that a pallet truck like the one described here will pay for itself in about three months. Thereafter, savings due to reduced labour charges can go towards balancing the rising costs in other fields. At critical times like the present, when foreign competition is hardening, this is a weapon which the textile industry can hardly afford to overlook.

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### International Organisation of Wool Industry

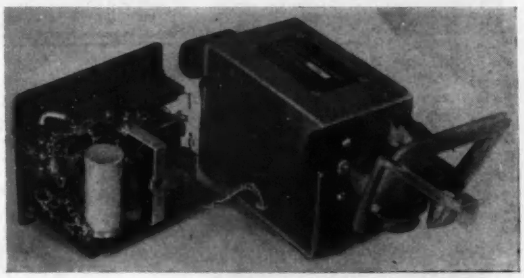
"If we rely on trade regulations sufficiently clear and detailed, I think the possibility of disputes will be substantially reduced," said Dr. R. Lombardi, a prominent Italian wool industrialist, speaking at a recent meeting of Bradford Textile Society. Dr. Lombardi is leader of the Italian delegation to the I.W.T.O., and was discussing international organisation in the wool trade. "In the wool trade we can vouch that the question, so far as raw wool and tops are concerned, has been solved happily through I.W.T.O. rules," he continued. "This assumption is well proved by the smaller number of claims, easily settled thanks to arbitration." Progress was being made with regulations for yarn, and an important contribution had come from the I.W.T.O. with its recent regulations on count tolerance, he said. But in the cloth trade much remained to be done. The I.W.T.O. was considering this point, but the definitions and rules on which it was possible to agree were extremely limited and general. "I dare say that usages and good faith are still the only rules prevailing in the cloth trade," added Dr. Lombardi. "I fully realise how long and hard is the way to the establishment of a system of rules suitable to this important sector."

# TEXTILE MACHINERY and MILL EQUIPMENT NEWS

# Operational Features in the "Yarnspec" Electronic Yarn Cleaner

*A new clearer, operating on the photo-electric cell principle, detects the rate of change of yarn diameter*

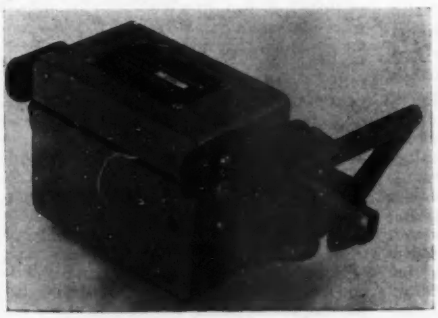
THE "Yarnspec" (Wilson-Hollins patented yarn inspector), manufactured by Thomas Holt Ltd., Rochdale and Darwen, has been developed and tested on a full production basis and a wide range of counts, over a period of more than two years. It operates on the photo-electric cell principle and has been designed to detect the rate of change of yarn diameter. In measuring the length of change, the unit may be set to allow the passage of minor neps where the substitution of a knot would create a fault larger than the nep. This action does not prevent the clearing of small slubs nor does it adversely affect the sensitivity of the unit.



A view of the compact arrangement inside the "Yarnspec" clearer

The "Yarnspec" is said to handle all classes of yarn equally well and, once set, requires no further tuning and maintains accuracy without fading. Furthermore, changes from one type of fibre or blend to another and changes in the count of yarn, do not impair the efficiency of the clearer or its high level of operation. Because a photo-electric cell principle is employed the unit is entirely immune to the moisture content and the amount of colour and dyestuff in the yarn.

Pointing out that the electronic inspector eliminates the danger of yarn scraping, the makers say they subjected three types of yarn clearer—electronic, plain jaw and comb—to extensive tests and that a comparison of results proved the unit gave a much higher standard of clearance than either of its mechanical counterparts and, where rate of production per operative was concerned, compared favourably with the plain jaw clearer and was well in advance of the comb clearer. Both the mechanical systems, it is stated, created many faults the scraping percentage for the jaw clearer being up to 40% and for the comb clearer up to 60%. It is claimed that the electronic inspector does not create faults because the yarn rides on "Sintox" guides and does not contact any metal apart from the tension discs. Under these circumstances there is no possibility of wear leading to the scraping of yarn. Power units will accept a mains variation of + 8·75% — 17·5% and up to 1,000 units may be fed by one central power supply. A number of supplementary controls are provided for use with smaller groups of units made up of any required number and a single setting will cover a range of counts.



Outside view of the "Yarnspec" electronic clearer (Thomas Holt Ltd., Rochdale and Darwen)

Each individual unit is independent and if one operates on detecting a fault, the remainder continue functioning undisturbed. All units are accurately calibrated in manufacture and share the same degree of sensitivity, responding equally to alterations in the main control setting. Threading yarn through the unit is a simple operation and once in position it cannot fall outside the controlling "eyes." The latter are ceramic and have a degree of hardness and resistance to wear second only to an industrial diamond.

A trap-action mechanism is employed for positive yarn cutting and, in addition to exceptional efficiency, this device offers a saving in maintenance in that the cutting blade does not require constant attention. The entire unit has been designed to keep maintenance requirements to a minimum and is easy to clean. Robustly constructed, the "Yarnspec" has all internal components protected by a dustproof case. Detector and cutter are also fully protected against accidental damage. New units do not require "running in" and are ready for use immediately on installation, taking less than 2 mins. to warm up. The mains distribution is fully enclosed and the current is fed through busbars. Checking for functional accuracy is a relatively simple job and may be carried out by non-technical staff.

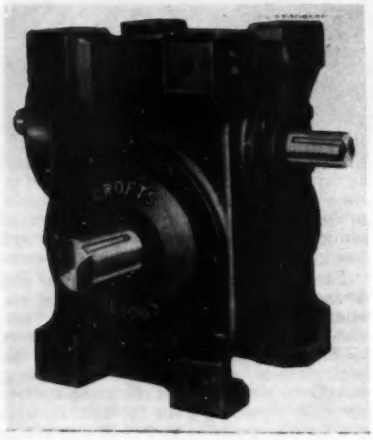
# New Meter for pH and mV Measurements

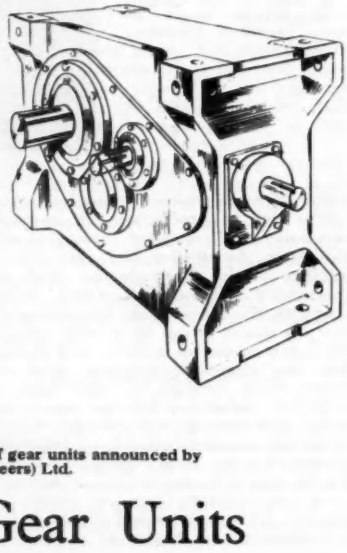
AFTER intensive research and development work, the Wissenschaftliche-Technische-Werkstatten, Weilheim, Upper Bavaria, Western Germany, have recently introduced a new pH measuring device which permits separate pH and mV measurements, has a dead-stop connection for titrations after Karl Fischer and incorporates a recorder. To ensure especially good zero constancy, a threefold voltage stabiliser has been incorporated, whilst switch elements for practically unlimited operation and industrial long-life tubes, which are provided for up to 10,000 working hours ensure operational safety and universal application. Efficient construction and high precision with simple servicing, together with a tilting device at the rear which allows the meter to be brought to a slanting position for convenience of reading, are stated to be features of this widely applicable apparatus.

The ph meter, type pH 39, is claimed to be eminently suitable for factory and laboratory control purposes in the textile industry.

Modern measuring chains for fluids, semi-solids, insertion purposes, surface-measurement, capillary electrodes, titration and micro-electrode, etc., as well as the water determination apparatus according to Karl Fischer, can be supplied. In addition all low and high resistance glass electrodes with internal resistances up to approximately 1,000 megohms, can be used, whether they are single-rod measuring chains or separate electrodes. On the back of the apparatus is found a "steepness regulator" which allows an exact calibration of the measuring chain with usual buffer.

**New improved pH meter**





**Views of the two new types of gear units announced by Crofts (Engineers) Ltd.**

# Two New Gear Units

THE primary feature of two new types of gear units announced by Crofts (Engineers) Ltd., Bradford 3, is their adaptability to a wide variety of mounting positions, shaft dispositions and ratios of speed reduction. This is accomplished by a standardised design employing a single type of gearcase cast with integral feet. The new types are the universal worm reduction gear unit, and the universal helical gear unit.

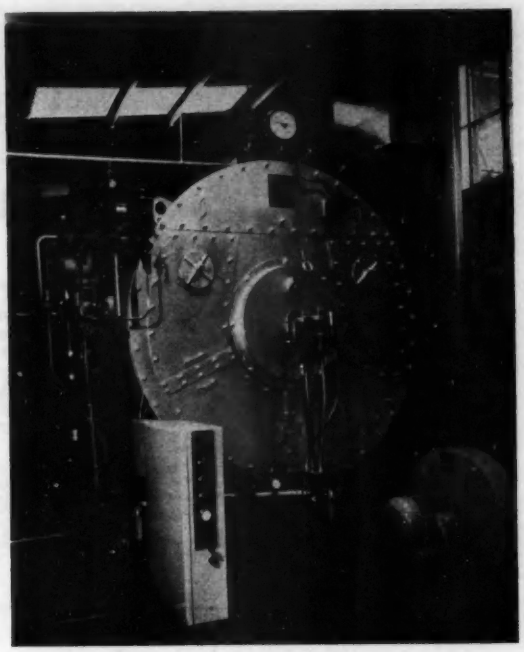
In the universal worm reduction gear unit the simplified design is common to worm gears of the following types: Standard (worm under wormwheel); inverted (wormwheel under worm); and vertical (wormshaft horizontal, wheelshaft vertical). The standardised design also makes possible up to 50 mounting positions and different arrangements of input and output shafts. The unit can be supplied in motorised form. Another advantage is the quick and easy modification from one assembly to another by the simple interchange of oil fillers, drain and level plug positions. The double extension worm-shaft makes either right or left hand assembly possible by simply removing the fan and cowl and replacing them on the opposite end. The range of sizes initially available have 4, 6 and 8-in. centres for powers fractional to 50 h.p., stock ratios 5 : 1 to 70 : 1.

The helical gear unit is adapatable to any installation in any mounting position and for any combination of gears or shaft arrangement. The gears are single helical throughout, standardised to give a wide range of ratios, with single, double or triple reduction gear trains as required, and with parallel input and output shaft dispositions—or available as right angle drives using spiral bevel gears for the first reduction. Regardless of the size or combination of gears, the input and output shafts are in the same horizontal plane, and for each size unit are dimensionally in the same disposition to each other, whether utilising single, double or triple reduction gear trains, or arranged as parallel shaft units or as right angle drives. This unit will be available in a wide range of ratios and up to 500 h.p. Smaller units will be available in motorised form.

## Personal

Mr. Geoffrey Loasby, formerly a director of British Nylon Spinners Ltd., has retired from the company. He joined B.N.S. from Courtaulds Ltd. in 1940 and has been technical adviser to the managing director for more than ten years, was closely concerned with the introduction of nylon yarn production into the U.K. at Coventry and Stowmarket during the early years of the war. Later, he was actively connected with the first large-scale expansion of B.N.S. production at Pontypool, at Doncaster and in Australia. Among the many valuable services which Mr. Loasby has rendered to the textile industry, his work as chairman of Council of the Textile Institute is well known and he was largely responsible for starting the South Wales branch.

# High Efficiency Packaged Boiler



P.11 Size packaged boiler having an evaporation of 4,800 lbs. of steam per hour from and at 212°F. (Cradley Boiler Co. Ltd.)

A NEW packaged boiler, the "Steampacket," recently introduced by Cradley Boiler Co. Ltd., Cradley Heath, is a three-pass horizontal type of semi-wetback construction having two independent rear tubeplates. The first receives the high temperature gases leaving the furnace and the second is contacted by the cooler outgoing gases. The design is said to eliminate any risk of damage by overheating and uneven heating of the rear tubeplate and combustion chamber also ensuring an increased proportion of the hottest gases is contained within the water space. The combustion chamber firebricks in this boiler are comparatively few and thus inexpensively replaced and the cooling effect of the water-cooled combustion chamber usually ensures many years of life without replacements. Plain tubes can be expanded in, in the ordinary way, it being unnecessary to weld them in and they can thus be easily replaced or re-expanded if required.

The boiler is part riveted, part welded, with the tubeplates flanged and the operator can raise steam rapidly from cold in approximately 35-40 mins. A medium pressure air type burner is installed. It is of fully automatic high/low/off operation, i.e., the flame which is normally high is reduced to low when the demand for steam falls off and is extinguished altogether when steam demand ceases or is exceptionally small. When steam is required again the flame is automatically relighted electrically.

The two-stage action for mixing and swirling of oil and air provides extremely powerful atomisation with good flame stability and efficient combustion. The air is pre-heated at the boiler face before passing to the combustion zone. Having a normal $CO_2$ content of 13·5% and an efficiency over 80%, the process is smokeless in operation. The control system is simple and the components easily accessible. An excellent feature is the ease with which the burner can be removed for inspection and cleaning; this is done merely by unscrewing one wing bolt. The electrode ignition assembly can also be removed by turning a cam lever.

The design of this unit which complies with the insurance companies' rules for unattended boilers, incorporates various safety controls, such as primary and secondary low water cut-offs which cut off the burner and ring an alarm bell in the event of low water. The burner is also cut off by a photo-electric cell if the flame should fail and by a pressure switch should the draught fail or fall below a certain level. A high steam cut-off is also provided by means of another pressure switch which shuts off the burner when a pre-set pressure is reached, and relights it automatically when pressure falls again. Additionally, a special anti-shock device known as "Grad-U-Start" eliminates blow-back on lighting up. The boiler combines a flexibility of operation responding well to fluctuating loads, with an economy in use and compact dimensions. An efficiency of 80-83% is claimed, and fourteen different sizes are available.

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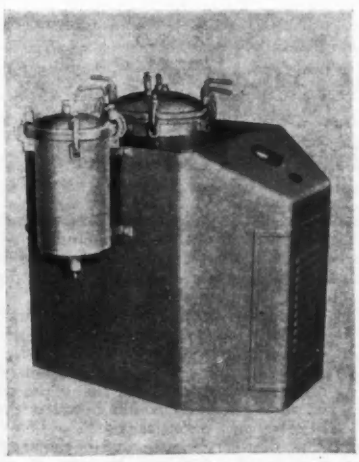
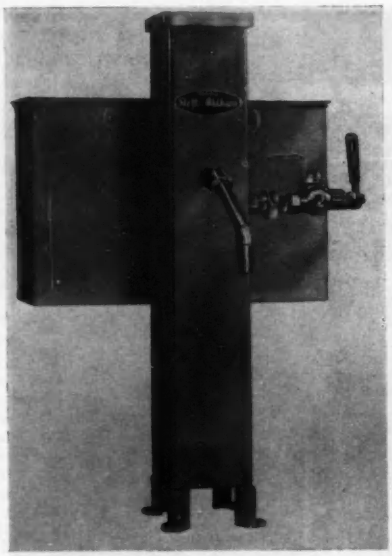
# Distillation Unit for Solvent Recovery



Schlegel D.E.200 distillation unit

BY connecting to any steamline, saturated or superheated, and feeding the exhaust steam back to a heating system, washing plant or auxiliary machine, the running cost of a new distillation unit, marketed by Liquid Systems Ltd., Wellesley Road, Croydon, Surrey, is said to be almost negligible. The Schlegel D.E. 200 is robustly constructed and comprises a well insulated distilling chamber of 44 gals. capacity with a water-cooled condensor, and can be fitted with either a manual or automatic temperature regulator. For removal of oils, greases, pigments and other dissolved impurities from white spirits and solvents it is clean to handle and simple to operate.

All solvents with a boiling point under 140°C. can be distilled by the use of saturated steam at 45 p.s.i.g. Liquids with a boiling point higher than 140°C. require superheated steam. The unit is also available fitted with electrical heating elements and automatic temperature control and is extremely useful for dry cleaners, chemical manufacturers and other industries wishing to restore solvents and white spirit ready for re-use. A smaller model, the Schlegel D.E. 30, is electrically heated and has a capacity of 6½ gals.



# Compact High Efficiency Steam-Heated Water Boiler

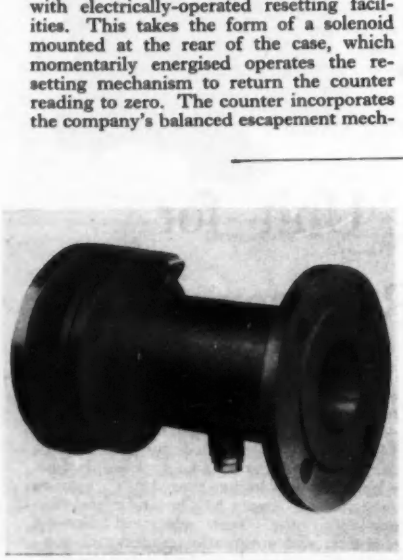
A NEW range of steam-heated water boilers under the name "Multiflow" is announced by James Stott and Co. (Engineers) Ltd., Vernon Works, Oldham. The main advantages claimed are that they give very large outputs for the size and cost. For example, at 50 lbs. pressure the No. 1 has an output of 550 pints/hour. The No. 2 gives 800 pints/hour and the No. 3 size gives 1,000 pints/hour.

Boiling water is available within 10/35 secs. from cold, depending on steam pressure available, and thereafter instantaneously. The design and positioning of the draw-off tap is so arranged that either a 3- or 5-gallon "Multipot" can be filled from the boiler without any special draw-off taps being fitted. Construction is of heavy gauge mild steel and copper, nickel chrome plated externally and all joints and fittings brazed, not soft soldered. The boilers are designed to stand up to heavy use and this, combined with simple operation make them ideal for use by non-catering staff, workmen, orderlies, etc.

# Electro Magnetic Counter with Electric Reset

COUNTING Instruments Ltd., 5 Elstree Way, Boreham Wood, Herts., announce that their Type 100 electric counter will shortly be available with electrically-operated resetting facilities. This takes the form of a solenoid mounted at the rear of the case, which momentarily energised operates the resetting mechanism to return the counter reading to zero. The counter incorporates the company's balanced escapement mechanism, and it is interesting to note that units taken from standard production have now been run for well in excess of 50-million counts, at speeds of 1,200 counts per second. One of the many advantages of this form of resetting is that a number of counters can be reset to zero at the same time by operating a push-button switch, which can be situated remotely from the counters. Another feature of this counter is that it can be electrically reset when operating without causing any damage to the counter mechanism. The counter can be supplied with firm's standard range of coils for both a.c. and d.c. supplies.

**Electric re-set on Type 100 gauge**



**Samson metal bellows expansion joint**

# New Metal Bellows Expansion Joints

A RANGE of metal bellows expansion joints is announced by Samson Controls Ltd., 19 Borough High Street, London, S.E.1. Employing as a means of absorbing pipe expansion a metal bellows made from seamless drawn tube of high copper bronze alloy, the joint is designed so that the steam, hot water or other medium flowing through the pipe-line bears only on the external surface of the metal bellows. This is achieved by the provision of an outer casing and an inner lining. Being connected at its ends to the extremities of both thus surrounding one and being contained in the other, the metal bellows is guided in its entire length between the two thus eliminating misalignment of the joint. By virtue of this design, the joints are claimed to have the following advantages:—

(1) Automatic centring of the metal bellows due to even external compression.
(2) Frictionless movement of the metal bellows as the medium being passed forms a natural cushion between the bellows and outer casing.
(3) The joint can be insulated in the same way as the pipe-line because of its smooth and even surface.

THE TEXTILE
COLOURIST & FINISHER

# The Assisted Durable Wash-Fast Pleating of Wool Fabrics

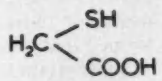
*Some details of a new wool finishing process which is based on the use of ammonium thioglycollate and a steam pressing treatment which so modifies the properties of wool as to endow it with enhanced reactivity to such conditions*

By B. C. M. DORSET

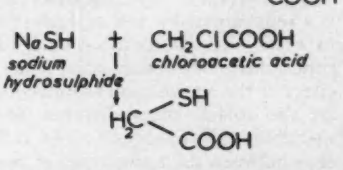
IN recent years much attention has been given to the production in dress and other fabrics of special pleating and creasing of a kind which can be regarded as permanent or at least having a high degree of resistance to washing and laundering. This applies to several different types of fabric but especially to those made with modern synthetic fibres such as "Terylene," "Acrilan," "Tricel," "Courtelle," etc., for it is a highly valuable property of such fibres that they are amenable to permanent distortion if effected under suitable conditions of temperature and pressure. In general, it has been found from practical experience in permanently pleating fabrics of various kinds that synthetic fibre materials give much better results than can be obtained on ordinary wool goods, although before the introduction of synthetic fibres wool was considered to have valuable pleating properties.

It can thus be readily understood how recent research in the finishing of wool materials has been directed towards improving the pleating properties of wool, and quite recently this research has been very successful in so far as there is now available the new Australian discovered pleating process (the *Si-ro-set* process developed by the Commonwealth Scientific and Industrial Research Organisation in Australia) which allows a relatively simple procedure the production of permanent pleats in wool fabric so as to make this type of fabric competitive with the pleatable synthetic fibre materials. This new wool finishing process is based on the use of ammonium thioglycollate and a steam pressing treatment which so modifies the properties of wool as to give it an enhanced reactivity to such conditions of treatment. Ammonium thioglycollate is the neutral salt of thioglycollic acid having the formula shown in Fig. 1, and this acid is made by reacting sodium hydrosulphide with chloroacetic acid and acidifying thus as set out in Fig. 2.

(left) Fig. 1




(below) Fig. 2




The special property of thioglycollic acid which is involved in this new finishing process for wool is its reducing action towards the disulphide bonds which hold firmly together side-by-side the long chain keratin molecules which give each wool fibre its normal fibrous structure and also its durability during everyday use by hindering the lateral separation of these molecules which must take place before substantial breakdown of a wool fibre can take place.

In carrying out the Si-ro-set process the wool fabric is treated evenly with a dilute solution of ammonium thioglycollate and a durable wash-fast crease or pleat is then formed by holding it in a steam press for a short period under suitable conditions of temperature and pressure. During this steam pressing both the chemical and physical properties of each wool fibre are changed so that the crease acquires a high degree of stability and, even if the fabric is treated so as to obscure or remove the crease temporarily, the fabric will always tend to return to its creased state whenever the fabric is brought into a relaxed condition—the processed fabric is in its most natural and stable state when the crease is present as produced by the Si-ro-set processing. Obviously Si-ro-set processing can do much to increase the usefulness and attractiveness of wool goods.

Before discussing in some detail the behaviour of the wool fabric towards the ammonium thioglycollate and the steaming conditions employed, it will be useful to indicate how this special form of wool pleating can be carried out on the large scale. For this purpose it is perhaps most satisfactory to consider the procedure recommended by the Commonwealth Scientific and Industrial Research Organisation of Australia in their Trade Circular No. 4 of 1958 and also some further Technical Notes No. 1 which can be freely obtained from

Albright and Wilson Ltd., London, who supply the ammonium thioglycollate solution in concentrated form and which must be diluted with water twenty times before application to the wool material.

It would appear that since the pleating or other form of creasing the wool material is most conveniently effected on garments such as men's trousers and ladies' dresses and skirts, as a final treatment the ammonium thioglycollate solution is most satisfactorily applied by a spray gun. Under these circumstances it is possible to confine the spraying to those parts of the wool material or garment where the crease is to be produced—a general all-over impregnation of the wool goods with the solution is wasteful of the reagent and is not always necessary.

In general, there should be sprayed on the wool material such an amount of the ammonium thioglycollate solution that the area of wool sprayed gains about 40% in weight—it is important to note that this amount is calculated only on the area sprayed and not on the total weight of the wool material since the success of the subsequent creasing, as produced by steaming, is governed by the proportions of reagent itself and also the accompanying water present at the time of steaming. However, in the case of durably pleating wool skirts it is generally found most convenient to spray the skirt all over. There is the further observation to be made that it is not wise to confine the spraying too closely to the desired crease since cockling may ultimately develop owing to a difference of texture being established between the sprayed and unsprayed parts of the fabric, and also because the steaming of wool fabric containing ammonium thioglycollate improves its general appearance. Thus in producing permanent creases in the legs of men's trousers it is better to spray the whole of the leg although it is unnecessary to spray say the trouser seat.

It has been noted above that the proportion of water present in the wool during the steaming plays a part and for this reason care should be taken that the sprayed wool goods should not be allowed to dry out between spraying and steam pressing. It is generally recommended that the interval between spraying and steaming shall not exceed 15 to 30 mins. not only to avoid drying out but also to avoid any decomposition of the ammonium thioglycollate which is liable to occur under such conditions of storage.

If the recommended procedure is carefully followed then the creases or pleats obtained will perfectly withstand dry cleaning and prolonged wetting by rain or otherwise; the creases will also withstand repeated washings, provided these are not too drastic. It is important to note that the wool is not made non-felting by the processing so that repeated washing with much squeezing will promote a gradual closing-up of the wool fibres with consequent area shrinkage and fabric thickening. If the process is not correctly carried out then the durability of the creasing will be so much the less satisfactory and there may be a point at which the whole procedure is made of no avail.

There is yet one other point that should be mentioned—it is that since the creases produced are permanent care must be taken in the re-pressing of say trousers or a pleated skirt since if the creasing is not effected in exactly the same positions as the durable creases first produced there will arise confusion between two lots of creases or pleats—the new and the old.

There is no necessity to wash out residual chemicals from the durably creased wool materials since ammonium thioglycollate is non-toxic and this is a great advantage for it would add considerably to the cost of the processing if the pleated garments had to be washed, dried, and repressed in the ordinary way.

## Action During Steaming

Turning now to the action of ammonium thioglycollate on the wool during the steaming and the manner in which it ensures that the creases formed have such excellent stability it is important to note that this reagent is a reducing agent and as such is able to break the disulphide bonds. The conditions of steaming, apart from the effect of the ammonium thioglycollate, are also able to effect a rupture of the so-called "salt linkages." The difference between these two types of bonds or linkages which are both effective in holding together laterally the adjacent and more or less parallel long chain wool molecules is shown in the formula given below and it shows two such molecules held together in the manner shown in Fig. 3.

The disulphide bond, $-CH_2-S-S-CH_2-$, is a relatively short one, but is more stable than the "salt linkages" which are generally much longer and which result from an attachment of a terminal carboxyl

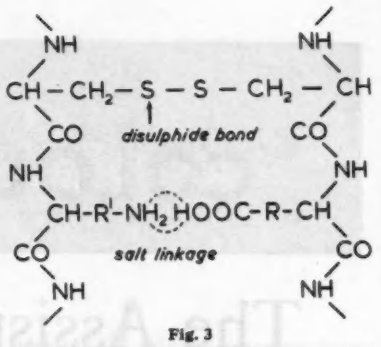


Fig. 3

(COOH) group of an amino acid residue extending from one molecule to a terminal amino ($NH_2$) group of another amino acid extending from the adjacent wool molecule. The disulphide bonds are best broken by application of an acid or alkali, or a reducing or oxidising agent, while the "salt linkages" are best broken by fairly strong acid treatment or by steaming. If either type of bond is broken under reasonably mild conditions so that substantial further chemical decomposition of the wool is avoided then on removal of the bond-breaking conditions there is opportunity for the bonds to be re-formed or new types of bonds to be formed in their place—as a result of this reforming of bonds the wool fibres may regain a considerable proportion of their original durability and strength. Actually processes have been discovered in recent years by which wool fibres may have their bonds broken under conditions which then allow new ones to be formed, and such that the wool fibres are given new improved properties—as for example, an increased resistance to attack by alkalis. It would at first seem likely that in the processing of wool by the Si-ro-set treatment the reducing action of the ammonium thioglycollate and the steam break the two types of bonds in the wool fibres and then promote the formation of new bonds just at the time that the fibres and therefore the molecules in these are strained into new positions relative to each other where the crease is made. The result of these changes would be to make a molecular accommodation necessary to ensure a permanent stable state of the fibres within the crease and, of course, this is exactly the fibre modification required to produce durable creases and pleats.

From the viewpoint of better understanding the new pleating process and thus enabling it to be steadily improved, it is important that the manner in which the molecular bonds

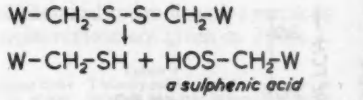



Fig. 4

are broken and re-formed should be known. Unfortunately there is at present some doubt about this matter but research is proceding which will no doubt clarify this chemical aspect of the process. Meanwhile it is interesting to indicate briefly what is actually in doubt.

In the pleating process the fibres, or at least some of them, become stretched in length and for the crease to be permanent it is obviously necessary that the stretched fibre thereafter shows no tendency to return to its original shorter length when exposed to normal conditions of everyday wear and tear. It is necessary for the stretched state of the fibre to become its normal state. Several years ago Speakman and other workers very carefully investigated the manner in which a wool fibre could be stretched (usually with steaming) to bring about its permanent elongation and it was suggested that the main molecular changes involved consisted of a rupture of the disulphide bonds given in Fig. 4 with a re-forming of new bonds by reaction of the terminal sulphenic acid groups with free amino groups made available for this purpose by a simultaneous rupturing of some of the salt-linkages as shown in Fig. 5.

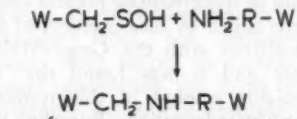



Fig. 5

There is also the possibility of some of the original disulphide bonds being re-formed but differently positioned.

It has also been suggested that the sulphenic acid group might react somewhat differently from that indicated above, especially in the presence of alkali, and form other bonds (Fig. 6) Here again the new bonds arise from a reaction between ruptured disulphide bonds and salt-linkages.

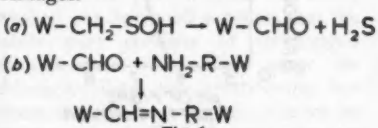



Fig. 6

In recent years this permanent setting of stretched wool fibres has been investigated very carefully by several workers including Farnworth (J. Text. Research, 1957, 27, 632) and evidence has been obtained to suggest that the molecular changes are mainly a temporary rupturing of the salt-linkages followed by their re-formation. It is not denied that a simultaneous rupturing of some of the disulphide bonds also occurs but it is contended that this merely initiates and assists the rupturing of the salt-linkages—the more disulphide bonds broken the more salt-linkages can be ruptured and re-formed. Farnworth has published much experimental evidence to support such a view.

Among the facts elucidated by Farnworth are to be found:—

**(1) Wool fibres whose disulphide bonds (up to 90%) have been permanently broken and made incapable by methylation of re-forming can be given a permanent stretch by the method of stretching in steam at 100°C.**

**(2) Immersion of the above permanently stretched fibres in an agent such as formic acid or a concentrated lithium bromide solution (known to be capable of breaking salt-linkages) destroys the permanent stretch.**

**(3) Ordinary wool fibres can be set in a stretched condition by suitable exposure to steam at any one temperature (100°C. or over) and the stretch then be destroyed by exposure to a higher temperature, and the same fibres can then be re-set and similarly de-set. This behaviour is consistent with the theory that the setting of stretch in a fibre is dependent on the formation of new "salt linkages" but not on that of the much stronger bonds resulting from re-formed disulphide or modified disulphide bonds.**

While the above facts support the view that "salt-linkages" are mainly involved in the setting of a wool fibre in a stretched and distorted state such as might be required in accommodating wool fibres in creases or pleats it has to be admitted that there are also facts which would suggest that an explanation can be found in postulating that the —S—NH— bonds (described above) could be formed and play an important part. The following facts might thus be appropriately mentioned:—

**(1) The removal of sulphur from wool fibres can much hinder or even prevent their setting in a stretched condition.**

**(2) Wool fibres can be set in a stretched state at low temperatures if methods are used which are known to produce a rupturing of the disulphide bonds.**

**(3) The setting of stretch can be hindered by pre-treating the wool so as to eliminate free groups or by treating it with 1-fluoro-2 : 4-dinitrobenzene to block these amino groups and so make them inactive.**

### Broken Salt-Linkages

But considering all these various facts Farnworth makes out a good case for believing that it is mainly the salt-linkages which allow the setting of a wool fibre in a permanently stretched condition and it follows that it is these same linkages which are involved in the Si-ro-set process for making wool fabrics readily amenable to durable and washfast pleating. The view taken is that in the pleating process the ammonium thioglycollate promotes a rupture of some disulphide bonds which in their turn assist the breakage of salt-linkages and that subsequently the conditions allow these broken salt-linkages to reform while the fibres are in their new distorted and stretched state so that this state becomes a natural and stable one. Within reasonable limits the greater the degree of rupturing the disulphide bonds the greater is the possible breakage of the salt-linkages. Thus Farnworth does not think that the formation of new —S—NH— bonds in place of the original disulphide bonds is fundamentally responsible for the ease with which durable pleating of wool fabric can be obtained in the Si-ro-set process where ammonium thioglycollate is the reducing agent primarly employed to rupture the disulphide bonds.

From the above it would follow that further progress could be made in devising treatments to facilitate wool fabric pleating by the use not only of substances capable of promoting an initial rupturing of the disulphide bonds but also of substances able themselves to break the salt-linkages whether or not they can rupture the disulphide bonds. A combination of such substances, one type for the disulphide bonds and the other for the salt-linkages, would appear ideal. Urea is well known to be effective in breaking salt-linkages in protein materials including wool and for this reason Farnworth has investigated its use together with ammonium thioglycollate or the alternative reducing agent sodium meta-bisulphite.

In these experiments the setting of the stretched wool fibres was carried out in water at only 30°C. (not the usual 100°C. as in steaming) and the fibres were held stretched 40% in the treating liquor containing both the reducing agent and the urea. Thereafter the stretched fibres were washed

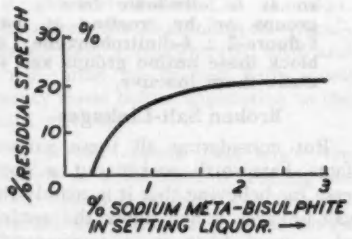



Fig. 7. Curve showing increasing assistance given to the production of permanent stretch in wool fibres in a 37½% aqueous solution of urea at 30°C.

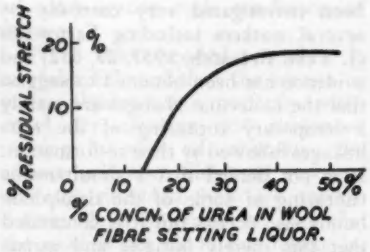



Fig. 8. Curve showing how an increasing concentration of urea in a wool fibre setting liquor at 30°C., also containing 1·6% of sodium meta bisulphite assists the production of permanent stretch

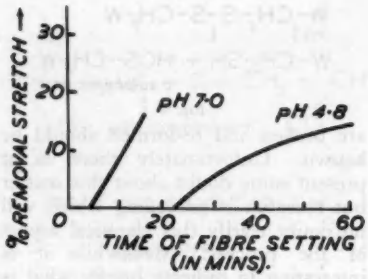



Fig. 9. Curves showing the effect of pH on the production of a permanent stretch in wool fibres in a 50% solution of urea containing 2·0% sodium thioglycollate at 30°C.

and released in boiling water for one hour and the residual stretch measured. It was ascertained that neither the reducing agent nor the urea were alone capable of securing any appreciable degree of permanent stretch in wool fibres under the conditions employed. The results obtained are shown by the curves in Figs. 7, 8 and 9 and it is evident that even at the low temperature of 30°C. quite a good degree of durable stretching in wool fibres can be obtained and that the combination of an agent capable of rupturing disulphide bonds and another for breaking salt-linkages could be profitably exploited for use in the pleating of wool materials.

Referring to Fig. 7 which shows the amount of permanent or set stretch left in wool fibres after allowing relaxation in boiling water the setting operation was carried out at 30°C. in liquors containing 37½% of urea and up to 3% of sodium meta-bisulphite as the reducing agent. It is seen that with liquors containing 1½ to 3% of sodium meta-bisulphite the fibres are left after relaxation with a 20% permanent stretch; it appears unnecessary to use a higher concentration than 1·6%. The curves in Fig. 8 shows the effect of increasing the concentration of urea in a solution containing 1·6% of sodium meta-bisulphite; it would seem unnecessary to exceed a urea concentration much greater than 40%. Thus good permanent setting of a crease should be obtained by producing the crease at 30°C. in the presence of a liquor containing 1·6% of sodium meta-bisulphite and 40 to 50% of urea.

It is known that the meta-bisulphite reducing agent can be replaced by ammonium thioglycollate as in the Si-ro-set process described above and that the effectiveness of this latter agent is generally greater under neutral or alkaline conditions. In Fig. 9 the curves show the extent to which wool fibres can be given a permanent stretch using setting liquors containing 50% of urea and 2% of sodium thioglycollate at pH 4·8 and pH 7·0 (acid and neutral conditions respectively) and by varying the setting time at 30°C. up to 60 mins. It is evident that a much more durable stretch can be obtained using a setting liquor at pH 7·0 and this durable stretch of nearly 20% can be obtained in a much shorter time than when the setting liquor is acid. This important effect of pH is further indicated by the curve in Fig. 10 which shows how the degree of durable stretch is influenced from pH 3 to pH 9 when a setting liquor is employed containing 2% of sodium thioglycollate and 50% of urea; the maximum durable stretch is obtained when a substantially neutral setting liquor is employed (it is recalled the Si-ro-set process is operated under neutral conditions).

## Experiments on Wool Fabrics

A characteristic of the Si-ro-set process is that the ammonium thioglycollate solution sprayed on to the wool fabric to assist the subsequent formation of permanent creases and pleats is not ultimately washed out. It is important that it should not thus be necessary to wash out any chemical residues since otherwise drying and re-pressing processes would be involved. So it might well be asked—What happens to the ammonium thioglycollate and how does it exist and to what extent in the fully finished and pleated wool material? Some answers to these questions have been found by Springell (J. Text. Research, 1958, 28, 874) and in the investigations carried out use has been made of a radio-active form of thioglycollate in which the sulphur atoms were an isotopic form of sulphur $S^{35}$ (these sulphur atoms had an atomic weight of 35 instead of the usual 32 and were radioactive so that their presence and therefore that also of the thioglycollate at any part of the wool fabric could be traced by use of a Geiger-Muller counter).

In the interesting experiments carried out wool fabrics were generally painted at the rate of 1 c.c. per 100 to 150 cm.² of fabric with a solution containing 4% of the $S^{35}$-labelled ammonium thioglycollate solution at pH 7·0. The creased fabric was then hot ironed to set the creases, the ironing being conducted in two different ways. In the first, the wool fabric was placed on filter paper and covered with several thicknesses of cheesecloth prior to the hot ironing while in the second method the fabric was placed on a metal sheet and ironed directly. It was found that creased fabric resulting from the first method was more uniformly radioactive and thus contained the thioglycollate more evenly distributed so that this method of ironing and setting the creases was preferred.

In the ironed wool fabric the total amount of thioglycollate present could be determined by measurement of the radio-activity with the Geigy-Muller counter and it was found that no appreciable amount of thioglycollate was lost by volatisation. But when the fabric was washed in cold water there was a substantial loss exceeding 50% according to the duration of the wash. This loss could also be confirmed by conversion of the sulphur in the thioglycollate in the fabric to barium sulphate ($BaSO_4$) followed by weighing this and so estimating the sulphur present. The results obtained with

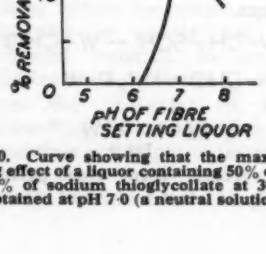



Fig. 10. Curve showing that the maximum setting effect of a liquor containing 50% of urea and 2% of sodium thioglycollate at 30°C. is obtained at pH 7·0 (a neutral solution)

these chemical and radioactive methods of measurement are given in Table 1.

Table 1

| Washing time in cold water | Thioglycollic acid content of wool in mg. per gram of wool by $BaSO_4$ method | Radioactivity method |
|---|---|---|
| 0 hours | 8·7 | 8·7 |
| 40 " | 3·7 | 3·6 |
| 350 " | 2·7 | 3·0 |

Thus whereas before washing the hot ironed wool fabric contains 4 to 9 mg. of thioglycollic acid per gram of wool there remains only 1 to 4 mg. after washing. Another feature is that generally about 90% of the thioglycollate is to be found, after hot ironing, on that side of the fabric nearest to the hot iron.

Further experiments showed that a considerable proportion of the thioglycollate left in the fabric after washing in cold water can be removed by further washing with aqueous solutions of various chemicals. Since the action of these chemicals differs widely the results set out in Table 2 will be found interesting.

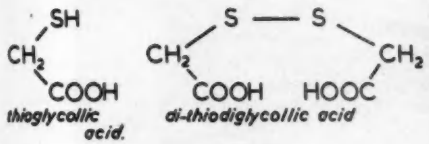



Fig. 11

It may be recalled that urea and lithium bromide solutions have good power for breaking salt-linkages but as seen by the above results they are not effective in removing residual thioglycollate from the permanently creased wool fabric. A further important observation was made that in attempting to remove residual thioglycollate with the various chemical liquors indicated above there occurred no removal of the pleats and creases whether or not the thioglycollate was removed to a considerable or only a small extent.

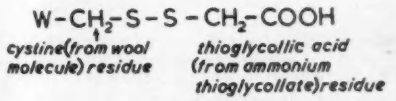



Fig. 12

In order to explain the fact that one part of the residual thioglycollate can be easily washed out by cold water while another part is much less easily washed out Springell suggests that the labile part consists of unchanged thioglycollate or possibly some dithiodiglycollate the relationship between these substances being shown by the formulae in Fig. 11, while the less easily removable part may consist of a mixed disulphide of formula in Fig. 12.

Table 2

| Agent applied | Concentration in solution | Temperature of treatment | Drop of radioactivity resulting from the treatment |
|---|---|---|---|
| Water .. .. .. .. .. | — | Hot or Cold | 0% |
| Sodium carbonate .. .. .. .. | 10% | Cold | 29 |
| Ammonia .. .. .. .. .. | 27% | Cold | 28 |
| Sodium carbonate + potassium cyanide | 10% of each | Cold | 97 |
| Ammonia + hydrogen cyanide .. .. | 27% of $NH_3$ + 5% HCN | Cold | 97 |
| Sodium sulphide + carbon dioxide .. | 10% $Na_2S$ + 5% $CO_2$ | Cold | 97 |
| Sodium sulphite .. .. .. .. | 10% | Cold | 85 |
| Sodium thiosulphate .. .. .. | 10% | Cold | 72 |
| Lithium bromide .. .. .. .. | 10 M. | Cold | 22 |
| Urea .. .. .. .. | 8 M. | Cold | 0 |
| Sodium thioglycollate .. .. .. | 10% | Cold | 12 |
| Sodium thioglycollate .. .. .. | 10% | Hot | 91 |

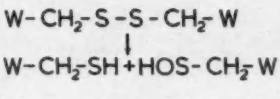



Fig. 13

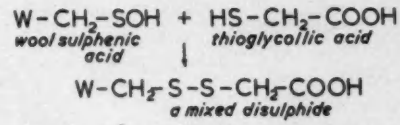



Fig. 14

Such a mixed disulphide could possibly be formed by a breaking of the disulphide bond in the wool molecule as shown in Fig. 13 followed by chemical union between the wool sulphenic acid and the thioglycollate as in Fig. 14.

Springell considers that only a small proportion of such a mixed disulphide is formed and in fact that less than 8% of the disulphide bonds present in the wool molecule enters into such reaction. On the whole Springell considers that the presence of residual thioglycollate in the wool fabric plays no part in ensuring permanent retention of any creases or pleats introduced with the aid of ammonium thioglycollate. He agrees with Farnsworth that the experimental evidence supports the view that the function of the ammonium thioglycollate is to rupture some of the disulphide bonds in the wool molecule thus loosening the fibre structure to promote a breaking of a large proportion of the salt-linkages and that it is reformation of these latter which is mainly concerned in ensuring the production of durable washfast creases and pleats. Most fortunate from the commercial viewpoint in exploiting the present valuable Si-ro-set pleating treatment is the fact that the ammonium thioglycollate gives rise to no toxic by-products which would make necessary a thorough after-washing of the pleated wool fabric.

# Fully Automatic Strapping Machine

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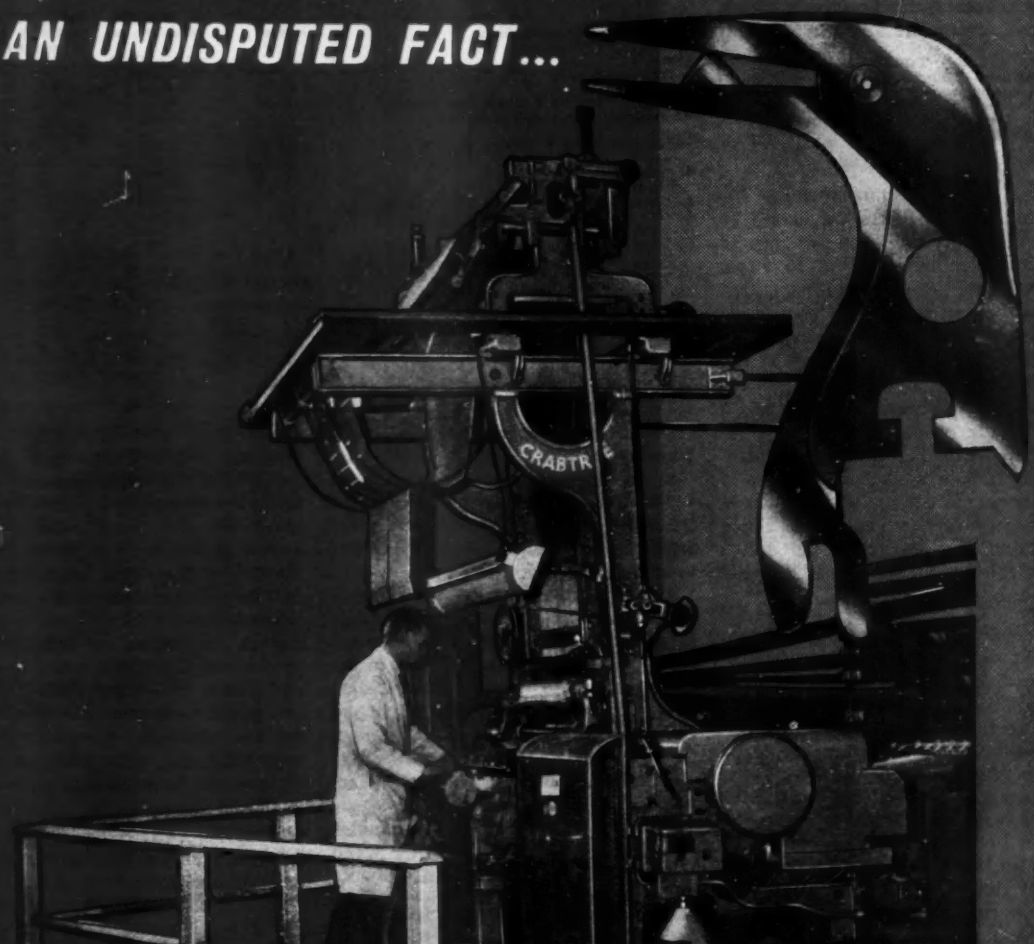


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# Fundamentals and Development of Raising

*The modern raising machine is expected to produce consistently the finishes performed previously and, in addition, a machine that can be readily set to zero position is capable of a mechanical fulling action on loom state cloth*

By N. PILKINGTON

THE process of raising is concerned principally with the treatment of the surface of a fabric but the effect it produces is much influenced by the construction of the fabric and the preliminary operations of spinning, carding and as far back as blending and selection of stock.

Originally, raising was achieved by roughening the surface of a fabric with natural vegetable teazles mounted on a board and scraped or brushed across the surface of the fabric. Later, the teazles were secured to the surface of a rotating drum and the process became more mechanical. About 1860 the advantage of mounting the teazles on a spindle, so that they were free to rotate individually, became apparent and the revolving teazle raising machine was developed.

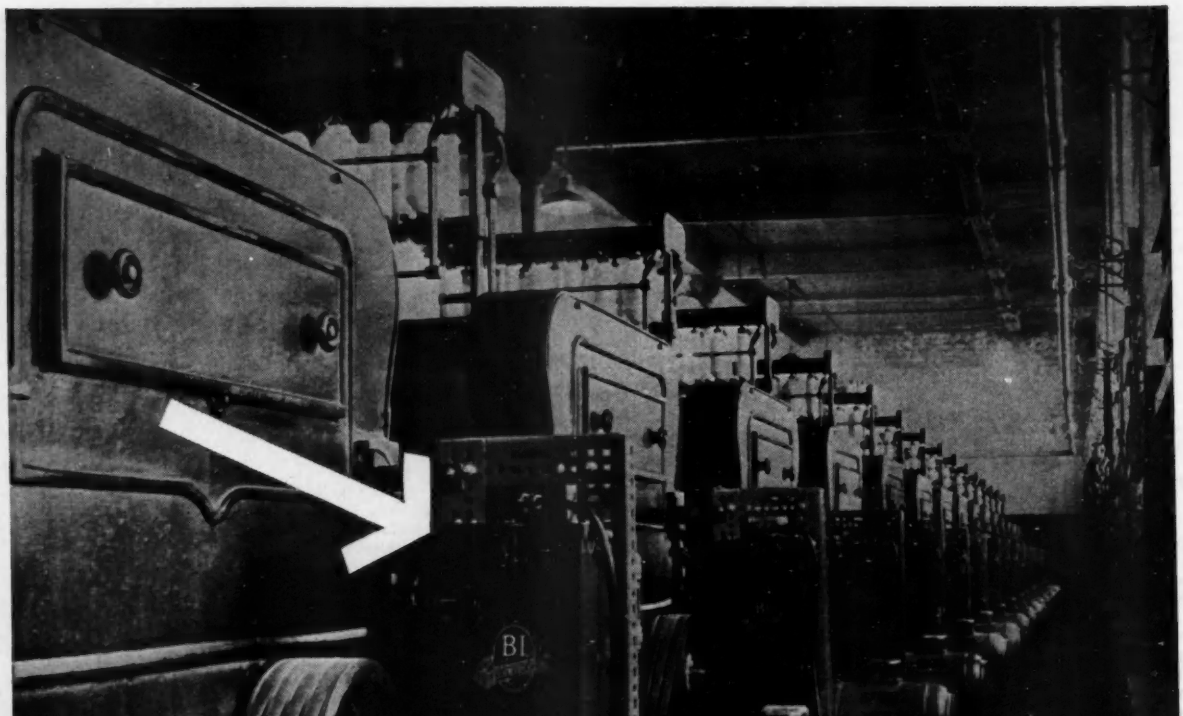
The idea of using some substitute for the vegetable teazle had been actively considered for probably 200 years but it was only in the mid-1870's that Edward Moser finally developed the original planetary wire card raising machine from which all of today's many types have developed. Moser's original machine consisted of 14 rollers mounted in a rotatable frame or cylinder with provision for altering the speeds of the rollers independent of the constant speed of the main cylinder. The rollers were wrapped with card clothing with all points leading in one direction. In essence, therefore, this original machine was the single action model of today.

The most important machine in industry today is the so-called double action type and, in passing, it should be appreciated that what in the cotton industry is referred to as a felting machine and in the woollen industry as a single action raising machine, are really the same, the difference being a matter of degree of raising energy. On a felting machine the speed of the working rollers is set very close to the speed at which they would naturally roll under the cloth, so effecting a tucking-in action upon any protruding fibres present on the surface of the fabric. On a single action raising machine, the speed of these working rollers is different to the extent that they tend to gain on the cloth being processed and so do useful work upon its surface.

A double action machine consists of a drum or cylinder round the periphery of which are mounted card rollers divided into two groups of equal number, set alternately and driven so that each roller rotates on its own axis. Half the rollers are covered with card clothing pointing in one direction and the other half with clothing pointing in the opposite direction. The main cylinder can be made to revolve and provision is made for passing the cloth under treatment over the worker rollers, which are designated the pile and counterpile rollers. The pile rollers are driven as an individual group as are the counterpile rollers, and the speed of each group, whilst being variable over a considerable range, is independent of the other group. Both sets of rollers rotate in the same direction, the difference between them being the way in which the card clothing is wrapped.

If it is assumed—as is always the case—that the peripheral speed of the main cylinder is different from that of the fabric under treatment, it will be apparent that a severe reaction is to be expected from that set of card rollers whose points are carried into the cloth by the rotation of the cylinder, *were those rollers not free to revolve upon their own axes.* To deal principally with the conventional machine in which the cylinder rotates in the same direction as the cloth travel, but at a much greater surface speed, it will be apparent that should the pile rollers (which have their points in the same direction as the cloth travel) be locked so as to be immovable, they would be carried into the cloth with very damaging results. Conversely, on this same basic machine, should the counterpile rollers be locked, due to the fact that their points are in the opposite direction to the cylinder rotation (and, therefore, to the cloth travel), no damage would occur as they would slip upon the cloth and would simply brush the fabric with the back of the card point. In other words, it would be impossible to rotate the cylinder with the pile rollers locked, but quite possible to rotate the cylinder with the counterpile rollers locked. This means that in order to allow the cylinder to rotate without excessive action on the pile rollers, these have to be rotated in such a way as to withdraw the points from the fabric as the cylinder rotates, and as they are carried into the fabric by that rotation. In other words, they have to rotate in the opposite direction to that in which the cylinder is rotating. Similarly, before the carding on the counterpile rollers can be

**After addressing a party of students from Salford Royal Technical College on a recent visit to Tomlinson's (Rochdale) Ltd., Mr. N. Pilkington (Technical Sales Representative), standing third left, demonstrated the ease with which the new 36/Az machine could be operated**



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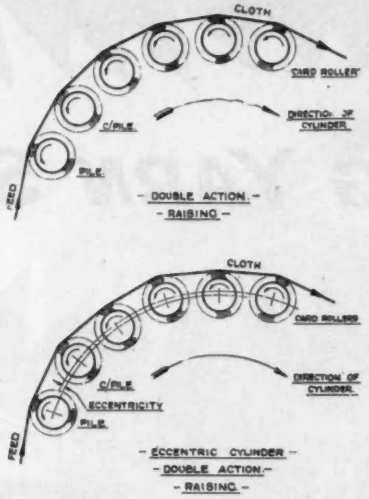
made to engage with the cloth at all, the rollers have to be rotated against the cloth to compensate for the fact that as the cylinder rotates the wires are drawn away from the cloth. In order to increase the action of the pile rollers, their speed must be reduced and, in order to increase the action of the counterpile rollers, the speed of these must be increased. These fundamental facts, with minor variations, are common to all planetary type raising machines.

Under certain conditions the relative speeds of the cloth, cylinder and card rollers are such that the points of the card clothing, both pile and counterpile, travel round the planetary system at exactly the same speed as the cloth, and no action, either positive or negative, then results between the card points and the cloth. It has only recently been appreciated that the mathematical computation of these speed settings is not sufficiently accurate to meet the demands made on the raising machine. Obviously, the mathematical computation of this point of now termed zero raise, must remain constant for each machine, provided the diameters of the card rollers over the card points also remain constant. Thus for any cloth speed with any particular individual machine there is always one constant mathematical speed at which the mathematical zero is apparent.

This point of mathematical zero is, in fact, something of a fallacy. It bears the same relation to the point of practical zero as does the I.H.P. of an engine compared with the B.H.P., Although in the latter, the reason for the difference in horse power —referred to as the efficiency of the engine —can be explained by factors of friction, loss of pressure and thermal efficiency, etc., it is not easy to explain the difference in the case of the raising machine. It can, however, be easily demonstrated that this point of mathematical zero has a different effect on different fabrics, is influenced by different types of card clothing, and differs in degree as card clothing becomes blunt and other mechanical discrepancies creep in to the overall condition of the machine. It is hoped it will be possible, in due course, to supply conversion factors—albeit emperical—which will help to assess these varying conditions, but the search for these still continues.

Although originally used to roughen the surface of fabric, much more is expected now from the raising machine. First, it is expected to perform in a fairly uniform manner to produce the same finish on the same type of fabric as was produced yesterday or the month previously. Secondly, a raising machine that can readily be set at zero position is capable of a mechanical fulling action on loom state fabric to relieve all mechanical stresses inevitably present in the cloth. At the true point of zero the card wires will penetrate into the material with the least resistance and under such conditions, the numerous wires entering and leaving the fabric without any undue tendency to lift out loose fibres, will allow individual filaments or strands to move and settle down to the stable woven construction.

On the newer fabrics such as spun rayons, staple nylon and other synthetics which do not re-act to wet fulling the properties of handle and bloom can be imparted with great benefit. Alternatively, it may be required to produce a high degree of surface cover in order to increase either the aesthetic appeal or thermal insulation




**Diagrams showing directions of rotation of cylinder and card rollers and setting of card clothing in relation to direction of cloth travel**

properties of the fabric. Indeed, the uses to which a raising machine is put are legion and increasing day by day, as new ideas and new finishes are conceived and developed. Nevertheless, the raising machine is still considered as a cloth finishing mechanism whose primary duty is to raise the fibres on the surface of a fabric.

To raise the surface of a fabric, the carding has to lift fibre ends out of a twisted yarn, and having probed for the unattached end of the fibre, to draw this to the surface with as little damage and mechanical breakage as possible. In practice, the means of performing this is by utilising the properties of a point on a generating circle moving within a larger circle, i.e. the property of a point of card wire wrapped on a circular roller which itself is rolling under a web of fabric. The point of the card wire describes a hypocycloidal path which is the basis of generation within the circle, and the main property of this hypocycloid is the ability of the point to produce changes in velocity towards and away from the point of contact with the larger circle. Mathematically speaking, the point decelerates as it approaches the fabric, is relatively at rest as it touches the fabric, and then accelerates away from the fabric as it leaves. This characteristic occurs only when the point is precisely in contact with the larger circle (i.e. the cloth) and it is this condition which is really implied by the phrase "zero raise".

### Speed Relationships

This precise speed relationship is comparatively simple to calculate but, unfortunately, the fabric does not present a true circle within which the card rollers can generate their hypocycloid, and is continually presenting a series of new circles to the point of generation. This then is the fundamental difference between the mathematical and practical points of zero raise.

If the rolling action of a circle upon a straight line is considered, it will be seen that a point on the periphery of the circle describes a curved path of length 4 × the dia., but the distance between the point's two contacts with the straight line is only $\pi$ × dia. The diameter being common to both expressions, it will be apparent that the ratio in question is 3·142 to 4 or nearly 1 to 1 : 3. Within the limits imposed by this ratio, all the deceleration, rest and re-acceleration of the card point must take place, and any velocities outside these limits must be compensated for by the resilience of the card wire itself. If the velocities are compelled, by external means, to exceed the combination of the ratio and the resilience tolerance of the wire, then the forces released are considerable, and are expended as either damage to the point (bending back of the wire), tearing of loose particles of the fabric under treatment (flock), skidding of the card point so that it grips and releases the fabric (evidenced by "roller marks" on the cloth), or most commonly by slippage of the mesna of driving the card roller.

To obtain anything like a reasonable efficiency of operation, it will be appreciated that a very precise control of roller speed is essential. Once the true rolling speed (i.e. *true*—not mathematical—zero speed) has been located, it is only necessary to vary from this as 1·3 to 1 to obtain optimum operating conditions. The control of raising action from the zero raise speed is not too difficult to achieve, but the location of the true zero raise condition has been the object of a search which has been going on for twenty years—in fact—ever since the first positive vee belt-driven machines were produced, and it is only within the last three years that the problem has been solved.

Consider an operating circle of 10 ft. girth, inside which a generating circle of 1 ft. girth is revolved. For each revolution of the assembly the generator will make ten revolutions (it is often argued that the generator would make eleven revolutions—one round itself, so to speak, but as in practice the same conditions apply to the generator roller running under the clutch circle and to the generator pulley running under the driving belt circle, the common extra revolution can, for convenience, be discounted). Should the generator be fixed and not free to rotate, and should the assembly make one revolution per minute, the point would have a 10 ft./min. velocity. This example is important, for it will be appreciated that should rolling contact be lost, the velocity of the outer circle becomes operative, and it is on this fact that the zero becomes of the utmost importance.

It will be apparent that if the assembly is rotated at 100 r.p.m., the generator will rotate at 1,000 r.p.m., still without doing any work upon the web of the fabric, with which it is in true rolling contact. If, however, the generator is set, by some external drive, to roll at 999 r.p.m. only, then a force proportional to 1 ft. per min. will have to be expended in the form of work on the web of fabric. As there may be 30 such card rollers (or generators) in the assembly, energy proportionate to 1/30 part of 1 ft.—nearly $\frac{1}{2}$ in.—has to be expanded from each. Part of the energy is absorbed by the flexing of the card wire, part by a stretching of the web of fabric, but most by penetration into the body of the fabric, and subsequent departure from it, drawing with it, as it leaves, a tiny proportion of the twisted strand of which the material is constructed.

In accepting this characteristic of the cycloid, it will be appreciated that the first point of contact of the card roller will be at a slight decrease of velocity with relation to the actual tangential point of

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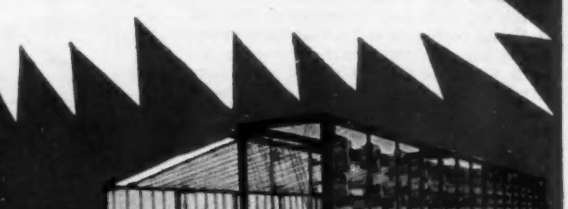

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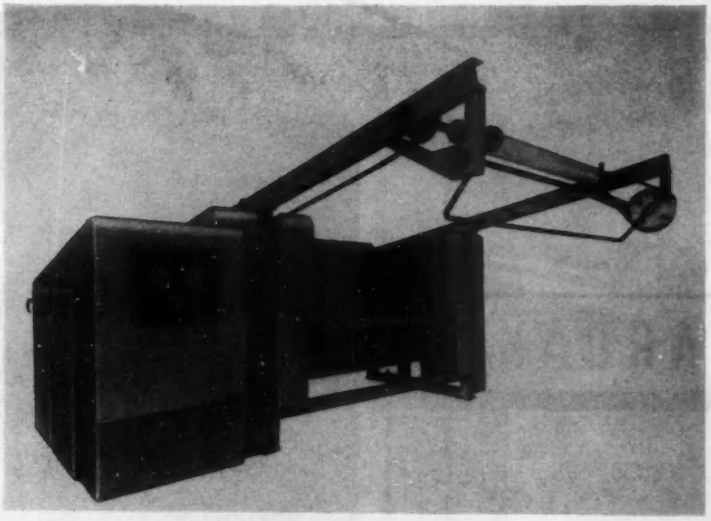
contact within the pitch circle itself. In this way, a natural penetration of the fabric by the card fillet is effected. An acceleration cycle occurs immediately after the point of contact, and it is during this acceleration that the actual raising takes place. It is not difficult to appreciate that if the machine consists of thirty rollers, all operating in sequence in the same direction, considerable forces would be released which could result in total destruction of the fabric unless the rate of acceleration could be precisely controlled. In a double action machine, however, where each forward pile acceleration can be neutralised by an opposite counterpile acceleration, these large forces can be split up into many small localised ones—between pairs of rollers.

In an application of this kind, one of the rollers of each pair will be chasing the cloth, whilst the other is presented to the cloth by the rotation of the cylinder itself, and it is evident that one roller (the counterpile) has a natural tendency to feel for the fibre and effect raising, whilst the other (the pile) is employed in synchronising with the cloth speed, and holding the fabric in position. The rollers must, therefore, be treated at least as pairs, with each pair linked to the next roller on either side by a web of fabric. Whilst one pile roller is holding the cloth so that its complimentary counterpile roller can work, and whilst it is applying a tension to that cloth to assist in counterpile penetration, it is also feeding any slack forward on to the points of the next-in-sequence counterpile roller. It will be appreciated that under such conditions it is more important than ever to locate the true zero point—from which the relatively few operational card roller revolutions can be measured—or damage of some sort will inevitably follow.

In order to obtain full control of these conditions, it was in 1935 that Tomlinsons introduced the more positively driven card roller. With the old flat belt type of machine the card roller revolutions were under such lax control that the rollers themselves were free to meet the resistance of the fabric, and having little or no control, the effect they produced could neither be measured nor reproduced. Much time and money have been spent in obtaining sufficient information on the effectiveness of this roller control, for if roller speed is held accurately and is incorrect, then very strong and serious forces are at work on the fabric. These can be more than the latter can tolerate, and damages can occur.

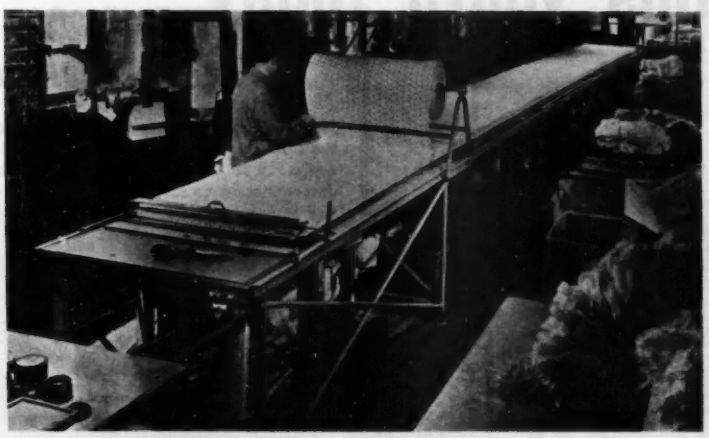
So far the fabric has been assumed to be stationary, and a further complication ensues as soon as this is moved. It will be obvious that if a state of true zero synchronism has been attained with stationary fabric, this will immediately become unstable with moving fabric. If, with stationary fabric at a state of true zero, a velocity is applied to the cloth of as little as 1 ft. per min., in the hypothetical case cited earlier, the cloth will be forced on to the counterpile raising points at this same speed, and drawn off the pile points by an equivalent amount. Such a set of conditions is called, in raising parlance—unbalance. The forces released by the counterpile rollers, having no opposing pile forces to counteract them, will cause, apart from a definite raising action, an instability of cloth which will be evidenced by tension changes over the surface of the cylinder. If a cloth speed of 60 ft./min. is attempted—(quite a normal practical speed change) the forces will obviously be sixty times as great.

Having located the true zero point—from which all raising commences, all types of finish can be assessed. The zero point will vary with each batch or type of material, it will alter progressively as the condition of the card clothing and driving belts alter, it will vary as the cloth speed is adjusted. The Tomlinson visual indicator of zero has, for the first time, revealed these changes in an easily appreciated manner.



**View of the Tomlinson 36/Az raising machine and the control panel**

# Combined Cloth Layer and Cutting Table



**The Lenson hand-operated machine**

A NEW development of considerable interest to the smaller factory is the combined cloth layer and cutting table manufactured by Lenson Engineering Co., Churchill Road Extn., Thurmaston, Leicester. The maker's claim that this low-priced hand-operated cloth layer is capable of laying up 100 lbs. of knitted fabric (about 150 yds.) in 8 mins. It should be of great interest to the small and medium-sized manufacturer in view of the speed of laying up, its price, and the great saving of fatigue to the operator. The cloth layer can be fitted round an existing cutting counter; or can be supplied as a complete unit with a plastic surfaced cutting counter. The illustration shows a 46 ft. lay 36 ins. wide (any length or width can be supplied) with the Lenson cloth layer fitted round an existing cutting counter.

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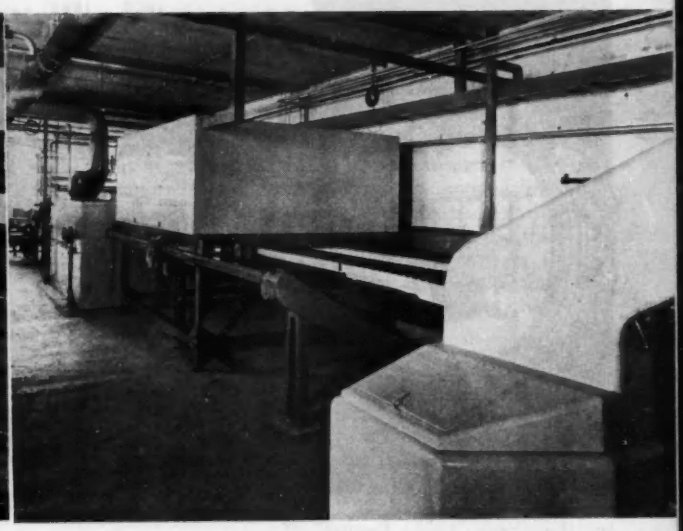
Nylon fabric to be set is fed on to the stenter. The plant is enclosed in a sheet metal casing 7 ft. 9 ins. long and 9 ft. 3 ins. wide, giving a setting time of 10 seconds at a speed of 12 yds. per minute



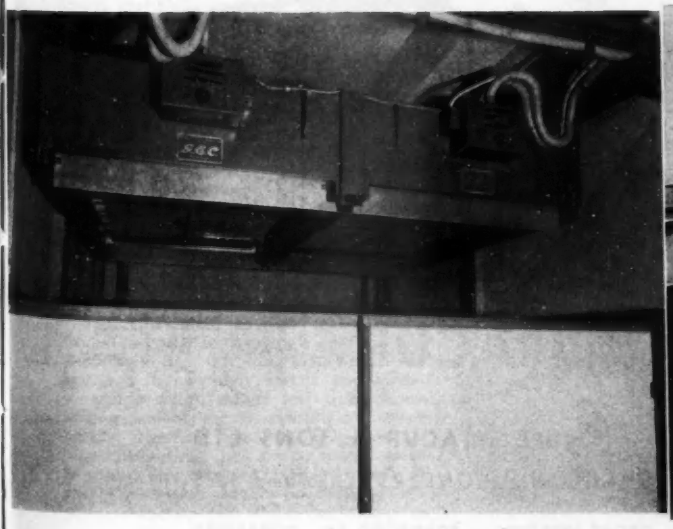
Nylon fabric on a combined pin and clip stenter emerging from the infra-red plant, which is enclosed in a sheet metal casing. The plant is 11 ft. 6 ins. long and 9 ft. wide and enables setting of the fabric in only 7 - 10 seconds. The infra-red panels are 86 ins. wide and 40 ins. long, giving a total maximum rating of 95 kW

# Setting Nylon Fabric in a Few Seconds

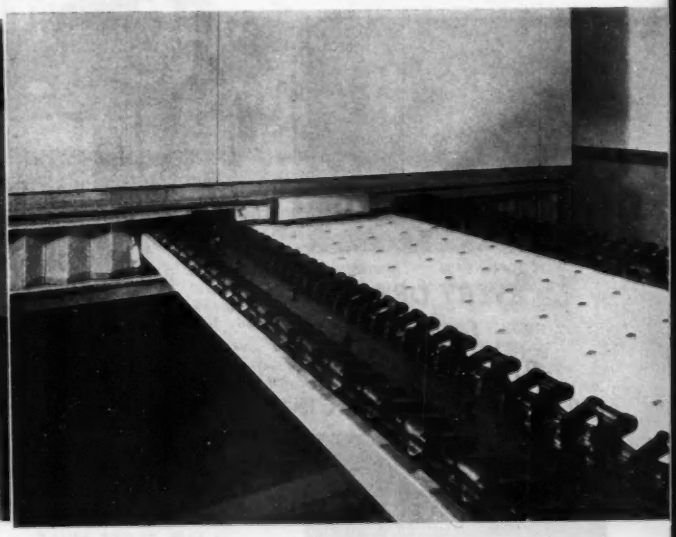
INFRA-RED heating plant developed by General Electric Co. Ltd. now provides the uniform heating required for setting fabrics, woven from synthetic fibres, in times of only 7 to 15 seconds. This is a comparatively new application of infra-red heating, and the company state that experience of several installations in Lancashire and Scotland have already shown that it has several advantages over conventional ovens in the setting of synthetic fabrics. In pointing out that infra-red plant is only a fraction of the cost of conventional ovens, it is claimed that the rapid setting avoids oxidation and therefore discolouration of the fabric, also that a much higher quality of set fabric can be obtained, and the plant will post-set fabric after dyeing.

In two nylon setting plants recently installed for Glasgow and Manchester firms the heating of the fabric is by infra-red radiation from sheathed wire elements mounted in panels which have been specially designed to give the uniform heating so essential. The panels are suspended on a floor-standing framework above the fabric which moves on a stenter. These panels are made to a standard length of 40 in., but the width is according to the fabric width. The number of panels used also varies, depending upon the output required.

View of the heating panels in a raised position



Close-up of the fabric leaving the nylon setting plant



1835 1845 1855 1865 1875 1885 1895

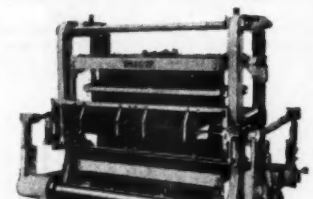
# WEAVING

1905 1915 1925

## through the years...

1935 1945 1955

## 1959



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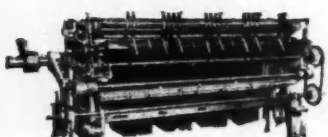

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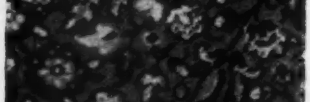

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The elements in each panel are arranged with their lengths at a small angle to the direction of movement of the fabric to produce even heating. The element ratings are carefully graded from the centre outwards, the outer elements being rated a little higher to compensate for the greater heat losses from the edges of the fabric. Groups of elements are switched independently so that the effective width of the plant can be varied to deal economically with a range of fabric widths. The elements are backed with reflector sheeting to direct the radiation and there are movable side reflectors—mechanically operated—which can be so positioned as to maintain the efficiency of the plant regardless of the width in use.

The temperature of each plant is controlled with a thermocouple attached to a special metal foil placed close to a heating element. The output from the thermocouple is fed to a very sensitive electronic controller. The controller automatically switches the elements on and off to maintain a desired operating temperature to within a few degrees. In this way the temperature in the fabric is kept to well within acceptable limits. The temperature of the plant is automatically recorded. Special safeguards are incorporated in the plant to protect the fabric from damage by overheating should there be an interruption in its movement through the plant. In this event the supply to the elements is automatically cut off and the heating panels are raised away from their working positions.

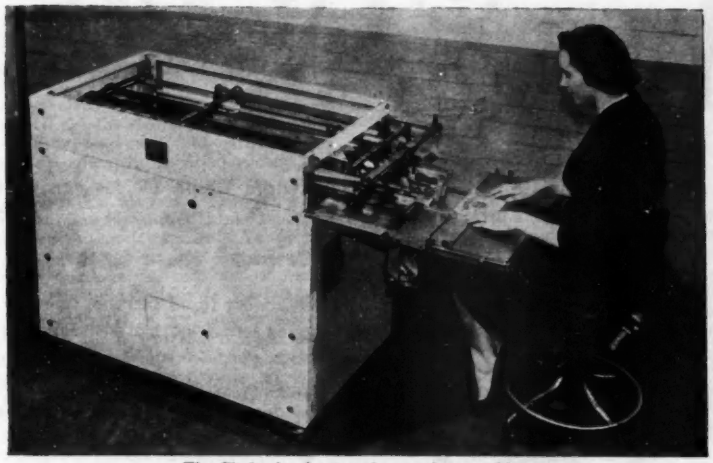
# Mobile Film-Wrapping Machine

OPERATED continuously for three years in the makers' own factory, the Chekmian heat-seal wrapping machine was found to repay its cost in the first year's working. Designed in co-operation with C. S. du Mont Ltd., the first of these new machines was installed for production testing in Chekmian Silks Ltd.'s Manchester plant. It proved so successful that by agreement with the designers it was put into large-scale production by an engineering concern owned by the Calico Printers' Association Ltd., the parent company.

Intended for wrapping a wide variety of substantially flat objects and articles with soft or irregular sides such as folded textiles, underwear and similar items, it applies a neat, fully-sealed wrap of either polythene or MST cellulose film. Notably versatile, it can be adjusted to take a different size in at most 3 mins., so that it can be used economically to handle a series of different jobs in quick succession. The Chekmian has already been proved on the wrapping of handkerchiefs, underwear, pillow-cases, dusters, tea-towels and dish-cloths, and socks.

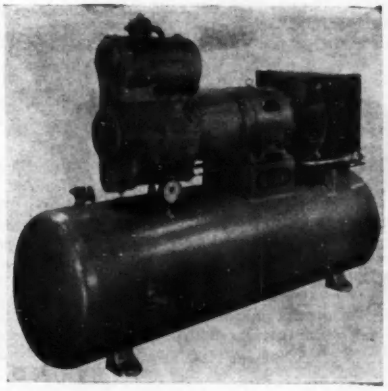
The operator has only to position the article on a sheet of film drawn from a conveniently-placed reel, to turn it over and feed it forward into the machine. The pack is then moved automatically through a series of stations in which the longitudinal seam is sealed centrally beneath the article, the open ends are tucked, folded and heat-sealed, and the neatly-finished package delivered by a gravity drop at the end of the machine. Whilst the output will depend upon the type of product and the operator's dexterity, a normal production rate of ten packs a minute with such articles as handkerchiefs may be expected after an hour or so's practice.

The Chekmian machine makes packs from 5 to 12 ins. long, up to 8 ins. wide and 2 ins. high. It is 6 ft. long, 2 ft. 4 ins. wide and 3 ft. 6 ins. high overall, and incorporates a ½ h.p. motor and three heat-sealing elements thermostatically controlled which together consume 1,260 watts. The heat-sealing bars are so spaced as to produce an effective, reliable seal at maximum speed. As they rise to the sealing position and operate whilst the package is stationary there is no distortion of the wrapping material. All the working parts are fully guarded and spring-loaded to make it accident free and also to prevent the machine being damaged by an oversize article being fed to it. Further details may be obtained from Chekmian Silks Ltd., 45 Poland Street, Manchester 4.



**The Chekmian heat-seal wrapping machine**

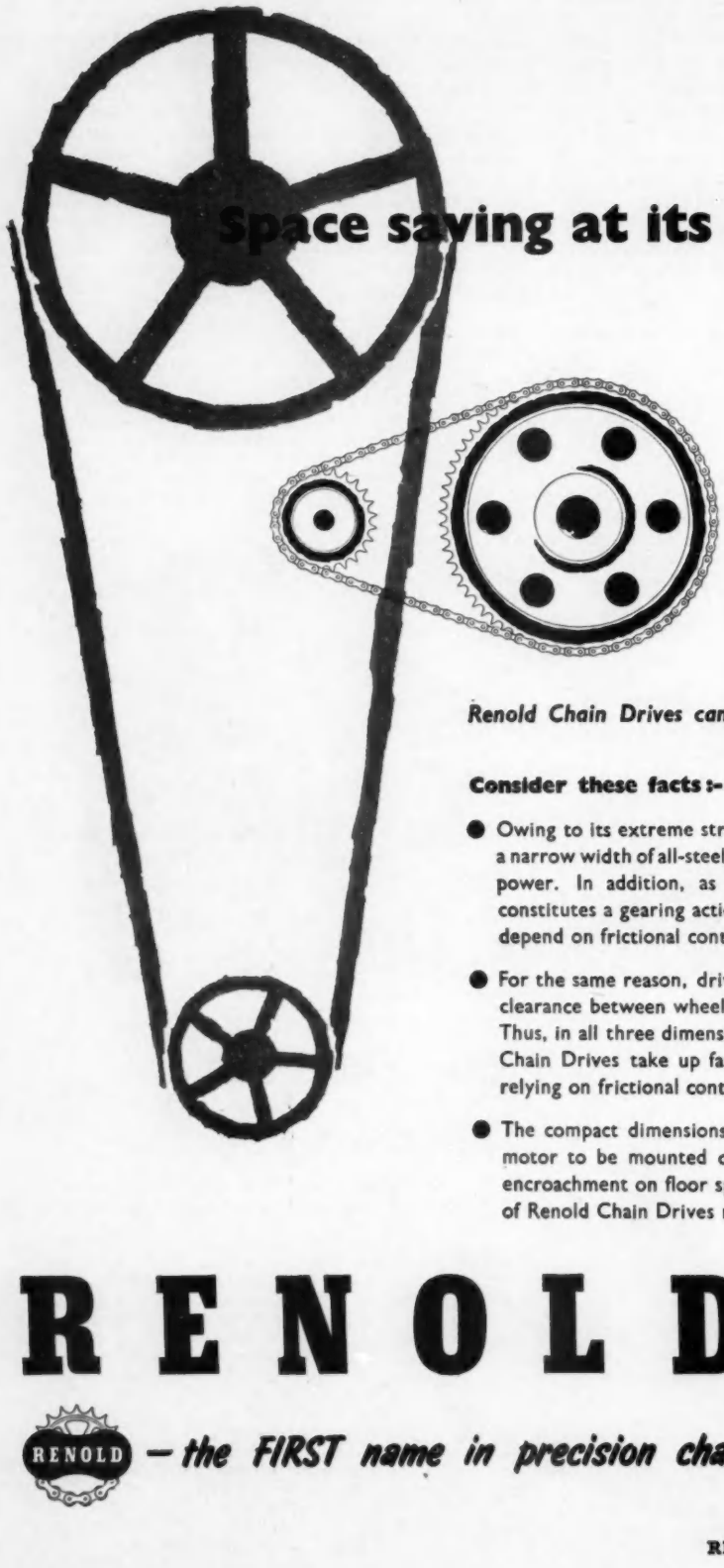
# Two New Stationary Compressors



TWO new stationary Hydrovane air compressors have been added to the range manufactured by Alfred Bullows and Sons Ltd., Long Street, Walsall. The first of these, the 200SR9501 has an output of 95 c.f.m. at 100 lb. per sq. in. and is mounted on a 6 ft. × 2 ft. horizontal air receiver. It is fitted as standard, with a water-cooled oil cooler and the water flow is controlled thermostatically. An air-cooled oil cooler can be supplied at an extra cost of £30 plus 20%.

The second unit is the 250SR12001 which has an output of 120 c.f.m. at 100 lb. per sq. in. This unit can be supplied with an air-cooled oil cooler at an extra cost of £40 plus 20%.

**Stationary Hydrovane air compressor**



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# *New Publications*

AUTOMATIC CONTROL IN TEXTILE PROCESSING. F. Blezzard, A.M.I.MECH.E., Drayton Regulator and Instrument Co. Ltd., West Drayton, Middlesex.

Meticulous attention to the control of raw materials, processing conditions and machinery efficiencies are the first essentials in any system of production planning. Although these three factors are so well known it is, nevertheless, amazing how some firms—large and small—fail to obtain the best utilisation of plant and equipment. It is probably true to say that no other industry in the world has so many variables to contend with as the textile industry. Raw materials vary enormously, the processes and machines are legion and operating techniques cannot follow rigid standards. The subject assumes ever increasing importance in view of prevailing economic circumstances and the urgent need for higher efficiencies and lower costs.

In presenting this valuable publication, Drayton Regulator and Instrument Co. Ltd. provide the textile industry with a first-class technical manual pin-pointing processes and stages where control is vitally important in the cotton and woollen and worsted industries. Profusely illustrated and comprehensive in coverage, the book commences with a brief description of bleaching, scouring and drying, showing the application of Drayton equipment for trapping. This is followed by a section on sizing in which the importance of automatic control is fully emphasised. Illustrations include the application of indicating controllers and motorised valves on size preparation and storage equipment, control and trapping of the sow box, and temperature control on cylinder dryers.

An important section concerned with dyeing gives details of the company's range of controllers—the DVI, DVIT Series 2 and DV3 Series 2. All Drayton dyeing controllers are compressed air relay operated and built on the unit principle. Typical control arrangements are shown on a high temperature enclosed package dyeing machine, a dye jig, a winch and a hank dyeing machine—said to be the largest in the world. Control and steam trapping on the Standfast molten metal dyeing process is discussed and illustrated, also equipment for the control of soaping ranges and in rapid drying. Important factors in stentering are outlined with the temperature control arrangements shown in place on a modern high capacity machine. Information on control in drying ranges, yarn conditioning, space heating and air conditioning in spinning rooms enhance the value of this treatise.

The last part of the book is concerned with the woollen and worsted industries. Processes wool washing, loose wool drying, backwashing, combing, hank scouring and drying, and tentering. In every case the control points are shown with advice on the selection of correct equipment. Textile production has long since ceased to a rule-of-thumb industry. Its ramifications are enormous and steadily increase. New materials and machines, new products and techniques widen the scope for automatic control offering accuracies beyond the abilities of even the best operatives. This book is timely and should be consulted by all concerned with textile mill economies.

A.D.

* * *

THE ECONOMIC DEVELOPMENT OF DETERGENTS. W. J. Corlett. G. Duckworth and Co. Ltd., London. 1958. pp. 208 (price 25s.).

This economic history of the British soap and synthetic detergent industries describes the changes that have occurred in the raw materials, in methods of manufacture, and in methods of marketing. The author studied particularly the development of the industries engaged in the manufacturing and marketing of both soap and synthetic detergents. After explaining the nature and use of detergents, Mr. Corlett surveys the structure of the British detergent industries from their early start in 1561, under the reign of Queen Elizabeth I, who was the first to grant a 10 year privilege to S. Groyett and A. Le Leuvyer to make white soap, to its present stage when soap firms not only produce soap but also manufacture and sell synthetic detergents. The manufacture of these products is explained in the following chapters. The importance of the marketing methods for soap and detergents is discussed, and the author thinks that without advertising and various sales promotion schemes there would not have been such a rapid increase in the use of synthetic detergents, particularly in the early stages.

One point amongst many that is clearly brought out is the fact that without the research and development of the chemical and oil-refining firms, which were largely responsible for the invention and development of such products, the producers and sellers would not have been able to establish such an increasing market. It was particularly the petroleum industry which provided the non-fatty raw materials suitable for the large-scale manufacture of industrial and household detergents. There is also an interesting chapter on the relationship between the structure of the soap and detergent industry and the rate at which innovations have been adopted. In his conclusions the author foresees scope for an increase in the use of synthetic detergents in the industrial sector, with a slower but steady increase in the domestic market. The book is well written and well worth studying.

B.S.

* * *

NEW DYEING ASSISTANT FOR "TRICEL." During recent years the practice of using carriers to assist the dyeing of hydrophobic fibres with the disperse class of dyestuffs has become increasingly popular. Research in Courtauld's laboratories has resulted in the discovery of a new active carrier principle which has proved effective for the dyeing of "Tricel" fibres. A booklet describing the carrier, named "Carrier LB," is now available from Public Relations Department, Courtaulds Ltd., 61 St. Martins-le-Grand, London, E.C.1.

SKINNER'S COTTON TRADE DIRECTORY OF THE WORLD, 1958-59. Thomas Skinner and Co. (Publishers) Ltd., 44 Brazennose Street, Manchester 2 (price 80s.).

The new issue of this reliable directory bears evidence of revision made necessary by changes in the productive capacity of the world's textile industries and by new developments in textile products. New sections have been added to include non-woven fabrics and bulked yarns and the fabrics section has undergone rearrangement to facilitate reference.

The U.K. industry is dealt with in five main divisions for materials, products and necessary services, with additional lists for silk and man-made fibres, linen, flax and jute and tufted carpets. Details of firms in over seventy overseas countries are given separately. Tracing trade-name proprietorship is made easy by the listing of more than 5,000 such names in a trade marks section and there is a classified directory of mill machinery, chemicals and accessories suppliers arranged under some 700 headings. Good indexing makes this reference work easy to use.

S.P.S.

* * *

BEETLE BULLETIN. A recent edition of this lavishly executed house organ, published by British Industrial Plastics, 1 Argyll Street, London, W.1, contains an article of special interest to finishers. Entitled "Finishing Finesse" it discusses briefly resin finishes in textiles.

* * *

MICRO-SWITCH DATA. The third edition of this novel production brings, once more, its miscellany of micro-switch data and current developments at the Micro-Switch Division of Burgess Products Co. Ltd., Dukes Way, Team Valley, Gateshead 11. The current issue contains descriptions and data for the CQ range of single hole mounting switches, 2 VA double-pole actuators, industrial micro-switches, CTHMS spring plunger models, CTHMSA adjustable roller lever models and CTHME 3-MSI one-way impulse switch.

* * *

JUBILEE OF LUWA LTD., ZURICH. Twenty-five years of growth and development of Luwa Ltd. and Metallbau Ltd., Zurich, Switzerland, are traced in this lavishly illustrated Jubilee edition. Written in French and English the publication provides a wealth of information and interest for all who are connected in any way to the famous Swiss companies.

* * *

RIGID EXTRUSIONS. British Resin Products Ltd., Devonshire House, Piccadilly, London, W.1. A new technical booklet describes the range of Rockite rigid extrusions, which are made from phenolic moulding materials and produced in a wide variety of sections. They are available in any length, do not require polishing and are said to be permanent in colour. They are also resistant to heat, chemicals, weathering and corrosion. The booklet has been designed to provide engineers and designers with relevant data in readily available form. Details and illustrations of section dimensions are given together with weights and methods of fabrication.

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# Textile Trade and Prospects

## *Cotton Exports Less than Imports*

Recent B.o.T. figures show that for the first time in the past two centuries cloth exports from Lancashire's mills have fallen lower than the amount of cloth imported into the U.K. In 1958, Lancashire cloth exports totalled 384,078,000 yds. valued at £51,000,000, while imports were about 2,700,000 yds. higher at 386,763,000 yds. Imports from Hong Kong during the year reached 116,081,000 yds. compared with 71,095,000 yds. in 1957. Shipments from China also increased to 39,306,000 yds. against 27,609,000 yds. On the other hand, imports from Japan decreased to 40,391,000 yds. compared with 56,465,000 yds. in 1957. Similarly, arrivals from India fell sharply to 120,946,000 yds. against 182,094,000 yds. in the same period.

Trade, in general, shows little improvement and buying in yarn and cloth is still very quiet. The announcement of the voluntary undertaking by Hong Kong to place a ceiling on exports to the U.K. from February 1 is encouraging and has brought a little more confidence into the industry. The decision of the Restrictive Practices Court on the question of yarn prices under the Yarn Spinners' Agreement has aroused considerable controversy but these two factors have had a distinctly adverse effect on business for many months.

Enquiries for yarns have covered nearly every count and quality but sales have been extremely quiet. Most of the modest bookings have been for standard weaving qualities in medium count American-type yarns, on cone, cheese and ring beams. The demand for combed mule-spun counts is still very poor and closure of more mills adds to the despondent atmosphere overshadowing the present situation. Coarse yarns are being sold in fair volume, also condenser types, but certain hosiery numbers in single and two-fold types are extremely hard to sell. Novelty yarns continue to attract buyers but only in small volume, and blended mule and ring spun yarns in the grey, and in coloured effects, find immediate purchasers. The trade is still afflicted with an unusually high proportion of complaints as an excuse for cancellations.

The same unsettled conditions operate in manufacturing circles. Few, if any, buyers will commit themselves any further ahead than circumstances dictate. Orders negotiated have only been sufficient to cover immediate needs and promises of rapid delivery do little to improve a cheerless situation. Most order books are in a sorry state and some managements seem to have become paralysed by their inability to cope with present problems.

Of the small amount of business finalised, dress goods have figured prominently. Some orders have gone through for coloured woven and printed shirtings, and dobby and jacquard novelties have had a fair measure of support. Certain types of furnishing fabrics have been better supported, with bright, printed contemporaries probably attracting rather more of the volume sold. Household textiles are in no better demand but hopes are expressed that buying to replace seriously depleted stocks cannot be withheld much longer. Cheap and low quality towels have become a drug on the market. Medium priced terries and the higher qualities are moving slowly all the time. Trade in quilts and cotton blankets is anything but good and sales of sheets, pillow-case cloths and tablecloths are disappointingly low. Several firms are working on new fabric developments. One is a type of bed-cover utilising terry principles in which the finished cloth has a kind of candle-wick effect achieved by using cotton roving as the medium for the raised pattern; in the finished state it is extremely attractive.

Export markets are still very poor, with most transactions operating on a hand-to-mouth basis. A few Continental outlets have bought sparingly of customary cloths and one or two Commonwealth markets have shown slight interest. In general, present off-take is lower than the depleted productive capacity but it is hoped the next two months will see an improvement.

## *Commonwealth Wool and U.K. Consumption*

In the second half of the Commonwealth wool marketing season the general view among importers was that values as a whole showed "a reassuring steadiness, with an occasional firmer tendency," states an I.W.S. trade correspondent. During the week ended January 17, no less than a quarter of a million bales of Commonwealth wool passed under the hammer in various centres. In Australia, three centres operating simultaneously sold an approximate 150,000 bales, two New Zealand sales at Auckland offered a total of 50,000 bales, the week's sales in South Africa produced catalogues totalling about 30,000 bales, and a further 20,000 bales of Commonwealth wool were offered in the first week of the London sales. Such a total offering might well have been expected to uncover any weak spots in the market, if such existed, but in fact the wool sold surprisingly well, with excellent clearances reported from all centres.

After a little irregularity at the beginning, both Australian and New Zealand markets closed on a firmer note and with a slight upward tendency on some types, and market sentiment in London was brighter than at the opening of the sales two days earlier. In primary markets, Japanese competition appeared a little less active since the year opened and French buying power had not yet fully adjusted itself to new conditions following devaluation of the franc. These two factors might have had some responsibility for reduced pressure of demand on the finest merinos. Bradford gave continued solid support in all markets, and good competition from Eastern Europe and from international merchants produced a total demand capable of lifting all the wool at prices showing steady continuity with those previously ruling. In New Zealand, the competition of the U.S.A. for medium and lower greasy crossbreds increased as a result of revised import arrangements under which a wider range of these wools may now be imported duty-free into the U.S.A. for carpet trade purposes.

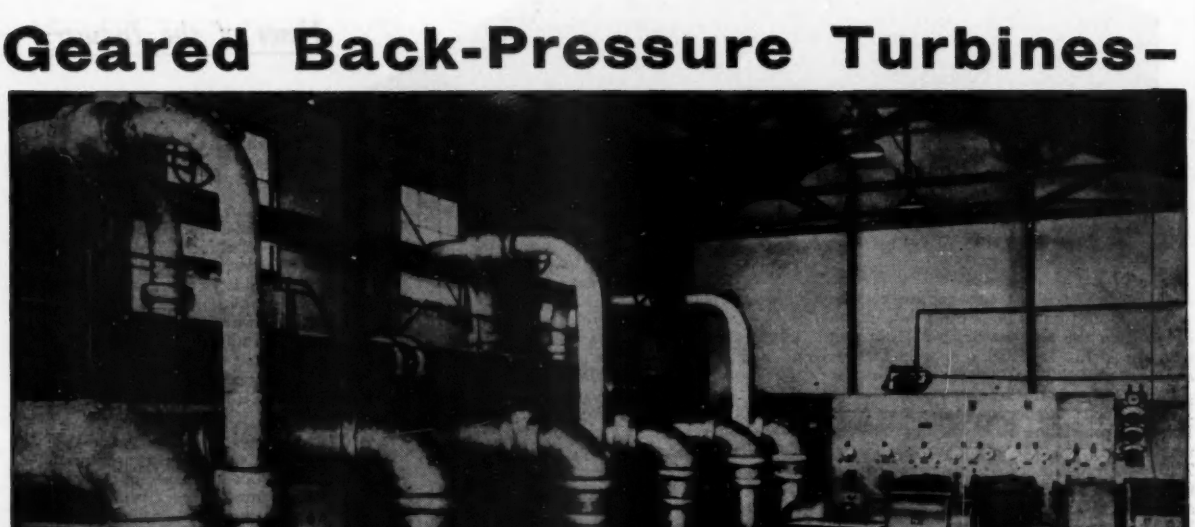
The rate of wool consumption in the U.K. continues to show an upward trend. There was a further improvement during November—the most recent month for which official figures are yet available—and the number of productive workers employed in the industry increased by no less than 849 to an estimated total of 147,102. The rate of wool consumption was more than 8% higher than in October, and 7% more than in November the previous year. Merino topmaking output was 10% up on year earlier, and crossbred top production 1% higher. In the woollen section of the industry, November consumption was 9% higher than in October and showed a similar gain on a year earlier. The delivery rate in worsted yarns was 3% higher than in October but 4% below a year earlier, while the wool cloth delivery rate was 2% higher than in October but 6% below November, 1957. November output figures were: wool consumption, 39·68 mill lbs. (clean); top production, 25·76 mill. lbs.; worsted yarns delivered, 18·44 mill. lbs.; woven wool fabrics delivered, 29·96 mill. sq. yds.; blankets delivered, 2·66 mill. sq. yds.

## *Linen Trade Review*

The fortunes of the industry during 1958 can be summed up in two words—retreat and consolidation. Retreat enforced by the expanding army of competitors in world markets, which is being re-enforced almost from day to day by the introduction of new man-made fibre products into markets formerly more or less exclusive to linen. Consolidation by amalgamation of individual concerns and concentration of activities to eliminate competition, reduce working cost, and dispense with surplus productive capacity which has too long threatened the economic wellbeing of the industry.

Even before the advent of man-made fibre textiles the British linen industry had been fighting a losing battle in world markets, due partly to expansion of domestic production in these and to increasing competition from centres of manufacture on Continental Europe, favoured in the first instance by protection, and in the second by lower manufacturing costs. High conversion cost in the British industry, and the seeming inability to bring this into line with that of its competitors is mainly responsible for the decline in demand for British linens.

# Geared Back-Pressure Turbines–



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While the alternative is obvious the ways and means of effecting it are not so apparent. The structural characteristics of flax fibre do not provide much opportunity for short cut processing. Nevertheless, where this has proved practicable, as in rove boiling to facilitate spinning, and in the bleaching, dyeing, etc., of yarns in package form, British linen manufacturers generally have lagged far behind their Continental competitors in availing themselves of the economies offered.

While the urgent need for elimination of redundant manufacturing capacity is freely admitted in all sections of production there is no general agreement as to how this can be effected in fairness to all. The casualties that occurred in the spinning, weaving and finishing sections of the industry during 1958 have gone only part way towards solving the problem.

Amalgamation, whether on a vertical or horizontal plane, provides opportunity for effecting economies in manufacturing costs in certain conditions of production and demand, ensuring full scale production of a limited range of products providing long runs, which are no more likely to prevail in the future than they have in the past. Current trends point increasingly to speciality and novelty lines with short runs and frequent changes, in which the greater flexibility of the smaller manufacturing unit shows to advantage. It may well be that a loose knit combination of independent concerns embodying the main advantages of the amalgamation and the individual unit will prove most suitable to cope with future demand.

Comparison of export figures for the ten months ending October 31, 1958, with those of the preceding year shows a substantial decline in all the main products excepting those included under the heading "sail cloth and canvas." Exports of linen fabrics to Commonwealth countries during the period show a drop of over 25% in bulk and in value. Exports of yarn declined by 12%, linen thread by 10%, while household linen goods, which include the "bread and butter" lines so essential for bulk turnover, registered a drop of 13%.

While the fortunes of the industry are influenced by many factors beyond its control there are others, no less important, which with foresight and co-operation, could be utilised to advantage. The uncertain raw material position and the considerable fluctuation in values has hampered forward planning in the manufacturing section and is largely responsible for day-to-day buying in the merchanting end, with the inevitable short runs and frequent changes which add considerably to production cost.

## *Jute Fibre, Yarn and Fabrics*

The raw jute markets were showing a less firm trend just before the end of the year and since then the position has become slightly easier. The alteration in prices has been small but there is more willingness on the part of shippers to make offers of the higher grades of white jute without combining them with a lower quality. Lack of sustained demand from most of the consuming centres may have been one reason for this quieter position. The rice harvest in East Pakistan has now been completed and fairly good prices have been paid for the quantities already sold. However, cultivators are still holding a substantial quantity of rice and it is possible that storage accommodation being at a premium more loose jute has had to be sent to baling stations and this could account for better arrivals of loose jute from upcountry in East Pakistan. This, in turn, has resulted in the quieter market with offers being more freely made.

As is only natural, since this easier trend in values, spinners have shown considerably less interest in raw material supplies and they are now looking for the higher grades to come down to minimum price levels. Dundee spinners have purchased a considerable portion of the annual cut-up already, and with shipments being promptly made from Pakistan this season their raw material position is very satisfactory.

Last year at this time speculative offers of new crop were being made and a certain amount of business was placed but so far there has been no signs of this taking place this season. At present prices are too close to minimum levels for speculators to operate to any extent. Mill First are being offered at £112, Mill Lightnings at £91, Mill Hearts at £79 and grade Hearts at £66, c.i.f. U.K., Jan./Feb. shipment but higher grades of white jute are only available in very small quantities. Shippers are still very reluctant to make offers of Mill Reds and higher grades until they have secured fibre of a suitable quality to bale into these grades. A few more offers of grade Tossa-2/3 are now being made but this quality is still rather scarce. The lowest price asked is £108 but Tossa-4 is freely available at £94, likewise Continental Tossa-2/3 at £87 10s. Crack Daisee-2/3 is generally quoted at £93 10s. and grade Daisee-2/3 at £87 10s., c.i.f. U.K., Jan./Feb.

The general position in Pakistan has improved during the past month due to the anti-inflationary measures adopted to increase agricultural production and the promotion of exports. In an effort to bring the country to a more stable outlook borrowing is to be cut to a minimum which coupled with economies in Government expenditure should fight inflationary trends. A larger output of consumers' goods is required and at the same time Pakistan should aim at producing a larger crop of raw jute from the acreage at present under cultivation of this, her main cash crop.

The second estimate of jute for season 1958 - 59 in East Pakistan is 6,000,000 bales as compared with 5,750,000 bales reported in the corresponding estimate last year. This shows an increase of 4·3%. The increase is attributed to favourable weather conditions, timely rains and availability of sufficient steeping water.

The actual acreage under jute is lower, being 1,529,000 acres as compared with 1,563,000 acres reported in the corresponding period last season. The decrease in sowings is said to be due to drought and other climatic conditions which prevailed at the start of the season. Despite the above official estimate of the jute crop reliable sources maintain that the out-turn will prove to be greater but there appears to be a genuine shortage of the better quality fibre.

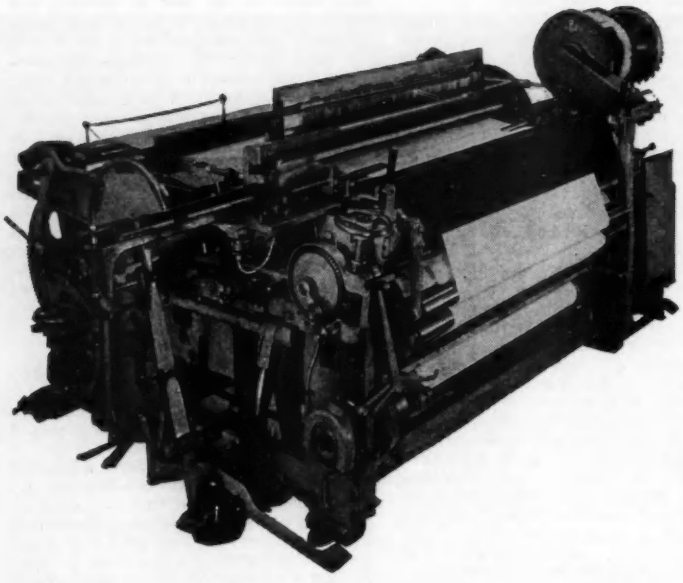
The Calcutta goods market became easier after the beginning of the year due mainly to lack of consumer demand. Speculators were operating to a certain extent and this made the position rather irregular. Buyers in the U.K. confined their purchases to daily small quantities and the position here was quiet. Quotations were at 59s. 9d. for 10 ozs. 40 ins., and at 45s. for 7¼ ozs. with 11 ozs. 45 ins. at 66s. per 100 yds. f.o.b. Calcutta for February shipment, B twills were quoted at 144s. February. The stocks of goods held by the Indian mills at the end of December were 1,500 tons lower in the case of hessians but 4,900 tons greater in the case of sackings as compared with the position at the end of the previous months. Despite the minimum price agreement in India it is quite evident that some mills have been selling below the recommended rates and this has been taking place, except for brief periods during the middle of last year, since the policy was introduced last February. A good demand was shown for yarns just prior to mills closing for holidays at the end of the year. Business was placed for delivery up to three months ahead. Since work was resumed on January 5 a fair interest has been shown but this has been confined to small quantities for delivery towards the end of February.

## *Man-Made Fibres and Cloths*

In many quarters, the agreement with Hong Kong has been received with mixed feelings, but the overall picture is one of relief in that these very protracted negotiations have at last been finalised and Lancashire now knows what lies ahead to some extent. Rayon and other man-made fibre producers are also glad that some measure of agreement has been reached because every section of the textile trade is affected by events in other sections. Hopes are expressed on all fronts that business will now pick up lost ground with a better atmosphere and more confidence in trading circles. In the limited advance orderings for spring and summer the available business has been fairly well shared in dress fabrics between rayon and cotton with nylon and "Terylene" in assuring demand. Furnishing fabrics, in general, have been in rather better request and again demand has been almost similar for both woven and printed designs.

The woollen and worsted industries are rather quiet with some firms finding this their slackest period since the end of the war. In these sections, the main output is still all-wool cloths, but "Terylene"/wool blends in suitings are in fair request, also wool/nylon, and wool/rayon specialities in coating and costume cloths and in an attractive range of furnishing fabrics. "Acrilan" is also being used in increasing quantities in both these sections. Spinners are producing some extremely interesting yarn blends, each with its distinctive points in physical properties, improved cloth constructions, and price considerations. Slower off-take is the strongest possible stimulant to exploit new ideas to appeal to buyers.

Trade in the Midlands is passing through a difficult period, due in no small measure to the continued growth of imported made-up knitted products from overseas. Those from Commonwealth countries are, of course, dominant in the mind of the trade and dissatisfaction is expressed that the agreement with Hong Kong left knitted fabrics outside the arrangement. Products, too, from European sources, continue to cause concern, especially knitted garments from French and Italian concerns. Business is fair in certain goods, such as vests, where the cold snap has stimulated "repeat" business from wholesalers, also for knitted sweaters.



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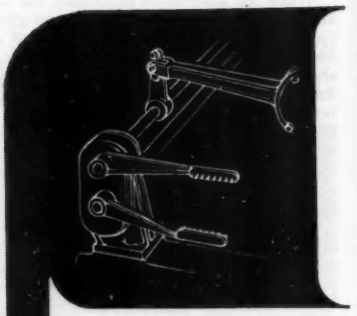

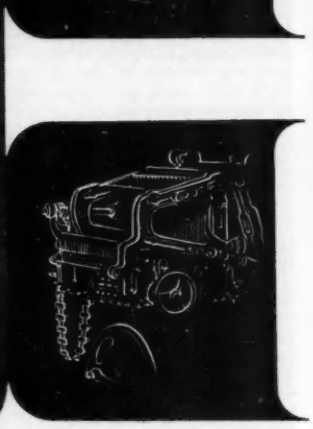

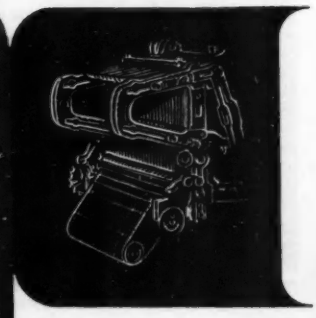

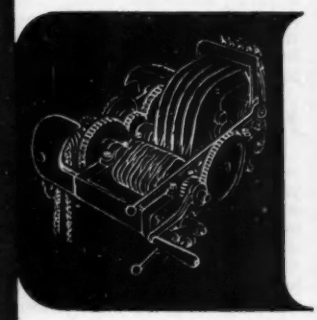

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Versatility is the keynote of the design and a choice of motions to meet all manufacturers' needs is available. Shown on the right are alternative shedding motions. From the top are: positive inside treading for up to 8 shafts plain weave; 25-shaft cam-operated non-positive 377 Model dobby, with lags and pegs; 377 Model dobby with paper pattern card, and 10-shaft non-positive cam box for weaves up to five tread.

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# Notes and News

### Third Nylon Factory for U.K.

British Nylon Spinners Ltd. have chosen a site at Brockworth, about three miles east of Gloucester, for a third U.K. factory for production of nylon yarns.

A factory with extensive buildings already exists on the site and B.N.S. are planning to convert the existing buildings for the production of nylon yarns rather than build a completely new plant. There are approximately 40 acres of land on the Brockworth site and the existing main factory buildings cover an area of some 650,000 sq. ft. Production is planned to cover a full range of nylon yarns, for clothing, household goods and industrial textiles, and it is hoped to reach full-scale production by mid-1961. Ninety per cent. of the jobs will be for men, since nylon yarn production is carried on continuously in three shifts. B.N.S. hope to recruit as many employees as possible from the immediate locality. The number employed will rise to between 1,200 and 1,500 in the first stages of production, increasing to a probable maximum of around 2,000.

* * *

### Higher Jute Demand is Possible

Comments on Pakistan's position as the great exporter of jute fibre were made by Mr. J. C. Niven, retiring chairman, at the recent annual meeting of the Jute Importers' Association. He said that the Pakistan authorities should take notice of the easy flow of raw jute exports during the past six months which had been brought by more reasonable prices. His opinion was that the demand for raw jute had been stimulated due to this reason. An even higher demand was possible if prices were reduced by a further £10 per ton. Discussing Pakistan's reported trade deficit, to which the import of food grains had greatly contributed, Mr. Niven warned against the raising of raw jute prices as an apparently easy way of closing the gap between imports and exports. That was no real answer as it would result only in a lower export demand for jute fibre. I would suggest that Pakistan makes a drive to increase productivity from the same land acreage—especially in the better class jute-growing areas—of both jute and food grains. The two-fold effect would be to increase the supply of jute to buyers at lower prices and cut down considerably the heavy bill for food imports.

* * *

### Wool Imports into Britain

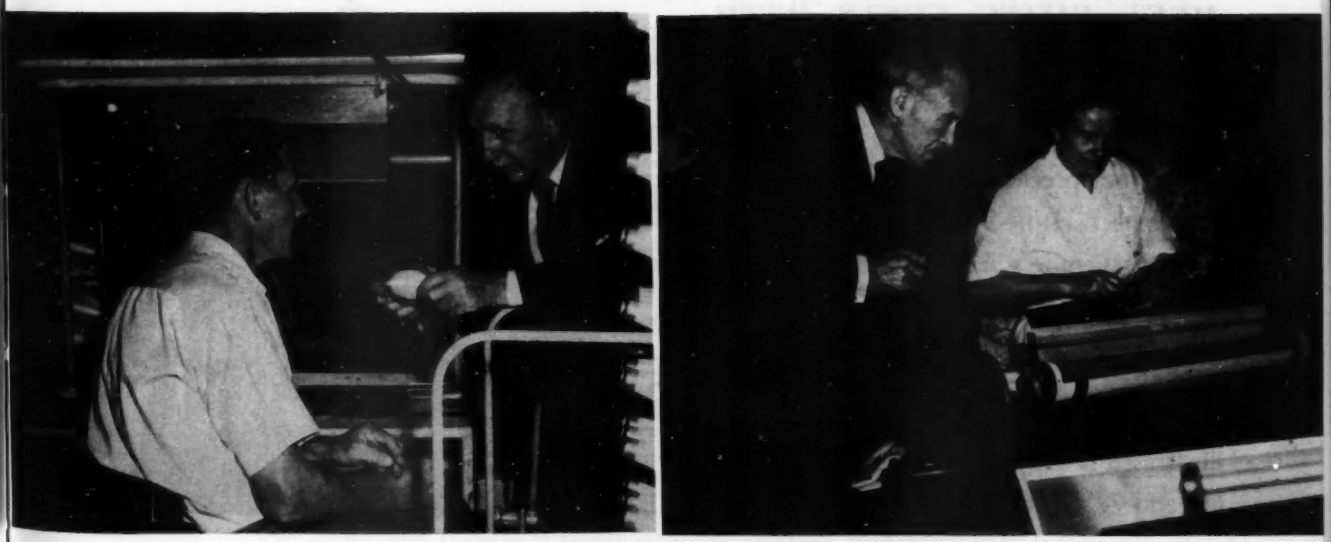
Imports of raw wool into the U.K. during December were 82·8 mill. lbs. (actual), the highest monthly total since January, 1957. This is one of the more encouraging signs for the wool textile industry of Britain, revealed by the Trade and Navigation Accounts of the Board of Trade. It indicates a greater willingness among importers to build up their stocks at the more reasonable prices ruling this season and is regarded as a promising augury for continued expansion in the rate of wool consumption which has been lately recorded in U.K. statistics. Over the whole year 1958, imports of wool into the U.K., however were about 2½% smaller than in 1957—some 659 mill. lbs. against 675 mill. lbs. the previous year. Imports from Australia fell from 315 to 292 mill. lbs., but were larger from New Zealand and South Africa than in the previous year. Imports from New Zealand rose from 166 to 168·7 mill. lbs., and from South Africa from 45·6 to 52·6 mill. lbs. Purchases from India fell from 18·9 to 12·9 mill. lbs., and from Pakistan from 10·9 to 9·8 mill. lbs. Imports from Argentina at 29·2 mill. lbs. were the smallest for three years, but those from Uruguay increased from 17·4 mill. lbs. in 1957 to 23·3 mill. lbs. in 1958.

An impressive feature of Britain's overseas wool textile trade last year is that exports of tops (combed wool) set up a new high record. The total was 88·8 mill. lbs., estimated to represent nearly one-third of the output of the industry, and exceeded by 5·5 mill. lbs. the previous export record of 83·3 mill. lbs. set up during 1957. Though Britain's top exports are spread over a wide range of countries, the new record was chiefly attributable to much increased shipments to China, now the largest single overseas purchaser of these goods, and which country accepted 15·9 mill. lbs. last year, compared with 8·3 mill. lbs. during 1957 and 12·5 mill. lbs. in 1956.

* * *

### New Appointment

British Nylon Spinners Ltd. have now established a new marketing department, to cover all activities in connection with promotion, merchandising and market research. In charge of the new department is Mr. E. Sharp, who for the last two years has been assistant to the managing director of B.N.S., Mr. F. C. Bagnall. He will work from the new London office at 68 Knightsbridge, London, S.W.1.



**The Bayswater, Victoria, plant of British Nylon Spinners (Australia) Pty. Ltd., was officially opened recently by Sir Dallas Brooks, Governor of Victoria. He is shown (left) in the final inspection and packing area of the new plant. (Right) The Australian Minister for External Affairs, Mr. R. G. Casey, watches a warping machine in the factory which, in full production, will have a yearly output of 5,000,000 lbs. of yarn**

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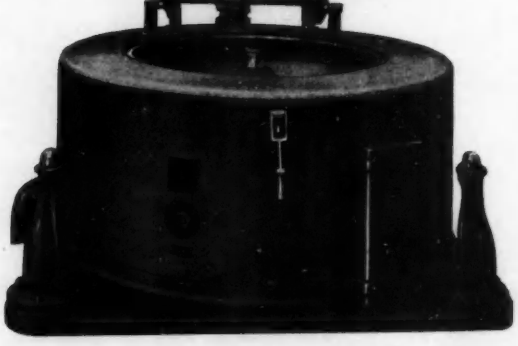
The Type 4(28) direct electric Extractor illustrated is supplied in standard sizes of 48", 60" and 72" diameter of basket.



**THOMAS BROADBENT & SONS LTD., HUDDERSFIELD.**

Phone: 5520/5

### Shrink-free Wool: a Scientific Achievement

The day is not far away when all wool materials and clothes will be included in the category of "easy-care" textiles, said Mr. A. N. Davidson (principal technical officer to the Wool Industries Research Association) in a recent lecture to the Wool Education Society in London. Although washable wool materials, which at one time were labelled "unshrinkable," had been available commercially since the early part of the century, it was only in the last 20 years or so that consistently satisfactory garments had been obtained, continued Mr. Davidson. By satisfactory, it was not implied that such wool garments were completely unshrinkable; rather they were "shrink-resisting."

There existed today a specification (issued by the National Hosiery Manufacturers' Federation) to which shrink-resisting wool fabrics could be made and which was designed to ensure that a satisfactory shrinkage behaviour would be obtained from these garments, providing they were given reasonable laundering treatment. It would be appreciated, of course, that there were many people who did not wash their garments in a reasonable way and it was unfair to blame the manufacturer for unsatisfactory behaviour of a wool garment washed under unsuitable conditions.

While the care of wool garments did not impose an excessive strain on the housewife, scientists and technologists were today engaged in attempts to render wool immune from the effect of even drastic conditions of wear and laundering. The production of satisfactory washable wool fabrics was not an easy matter and could not be achieved by merely applying a suitable chemical treatment to any knitted fabric, continued Mr. Davidson. Although the chemical finish could eliminate true felting from a wool fabric, such treatment could not by itself produce a stable fabric. For complete satisfaction, co-operation between the manufacturer and the finisher was necessary.

After describing various methods by which wool fabrics could be made shrink-resistant, Mr. Davidson said that a new process was being developed commercially by the Wool Industries Research Association, and although the work was started only in 1956 considerable quantities of wool materials were already being processed satisfactorily under commercial conditions. In the process, wool, or wool-containing materials, were treated in a mixed bath containing peracetic acid and sodium hypochlorite under either acid or alkaline conditions, depending on the material to be processed—fabric, garments or yarn. This process had several points of difference from most other wet processes, the chief being that the rate of dye uptake by the treated fibre was less than that of the untreated fibre. No loss in weight of wool substance was caused, and a very soft handle was produced without the use of softening agents.

* * *

### Double Twist Spindles

Westmorland Spindle Co. Ltd., 24 Birchin Lane, London, E.C.3, ask us to point out that users of Westmorland double twist spindles can readily obtain spare parts for these direct from them.

### U.K. Wool Workers Working Week

Union representatives, in theU.K. wool textile industry have placed before the employers' council detailed proposals for a phased reduction of the working week in the industry from 45 to 40 hours, coupled with an application for a 5% increase in wages. The last increase, of 3%, was awarded in April, 1958, under an agreement which terminated last November. The union suggested that a 40-hour week should be achieved in stages during a three-year period up to 1961. The employers' council promised to examine the proposals.

* * *

### Courtaulds Textile Division

The weaving and knitting activities of Courtaulds Textile Division, which is responsible for production and marketing Courtaulds/Celanese fabrics, are being split into two separate businesses staffed by existing personnel.

A new subsidiary, Furzebrook Knitting Co. Ltd., has been set up to carry on business in Courtaulds/Celanese knitted fabrics with sales headquarters at 1a Welbeck Street, London, W.1.

Woven fabric business will continue to be operated by Courtaulds Textile Division until transferred to another subsidiary company, Samuel Courtauld and Co. Ltd. Details will be announced later. Sales headquarters for woven fabrics will remain until further notice at 16 St. Martin's-le-Grand, London, E.C.1.

* * *

### Merino Wool in Australian Clip

Australia's wool clip for the 1957-58 season included 73.2% merino wool. This is the highest merino percentage shown in figures for the past five seasons, issued by the Australian Wool Bureau's Statistical Service. Because of adverse seasonal conditions, the 1957-58 clip showed a decline of 494,000 bales when compared with production in 1956-57. Largely for the same reason, the percentage of fine wools (60's and above) was rather more than 2% higher than in 1956-57. Wools free from vegetable fault or containing only light burr comprised almost 79% of the 1957-58 clip, the best figure since 1952-53.

* * *

### Spindle Makers in Scragg Group

Ernest Scragg and Sons Ltd., Macclesfield, announce they have completed arrangements to take over Wm. Bodden and Sons Ltd., the Oldham firm of spindle makers. During the post-war years, the Scragg concern has taken a close interest in spindle design, and has pioneered many new developments to provide greatly increased speed, to meet the problems of increased package sizes and of vibration. Wm. Bodden and Sons Ltd. will be reorganised and continue to manufacture spindles for all sections of the trade.

* * *

### Selkirk Firm Acquired

Heather Mills Co. Ltd., the well-known Selkirk tweed manufacturers, have acquired Corbie Lynn Mill Ltd. Cloth manufacture, notably of the crepe woollen and worsted cloth in which Corbie Lynn has specialised, will be undertaken at Heather Mills factory and a certain amount of Corbie Lynn equipment will be transferred to Heather Mills.

* * *

### Teleprinter Service

The Birmingham, Glasgow and Manchester offices of English Electric Co. Ltd. have been connected to the national Telex service. The office numbers are as follows: Birmingham No. 33177; Glasgow No. 77423; Manchester No. 66428.

* * *

### Zurich Office for Bancroft

Joseph Bancroft and Sons Co., Wilmington, Delaware, U.S.A., have established a subsidiary company, Joseph Bancroft and Sons Co. A.G., at 272 Schaffhauserstrasse, Zurich 11/50, Switzerland. The opening of the office in Zurich was considered necessary for the closer supervision, support and expansion of the "Everglaze" and "Ban-Lon" programmes in Europe.

## *New Companies*

**Connell and Knott.** Private. Reg. Dec. 30. Capital £5,000 in £1 shares. Merchants, manufacturers, and dealers in wool, worsted, etc. Registered Office: 14 Thornton Road, Bradford.

**Ungar Fabrics Ltd.** Private. Reg. Dec. 30. Capital £15,000 in £1 shares. Weavers, manufacturers, spinners, etc.

**W. Whittingham Ltd.** Private. Reg. Dec. 17. Capital £1,000 in £1 shares. Textile and hosiery manufacturers, etc. Registered Office: 15A Greek Street, Edgeley, Stockport.

**Crawshaw and Park Ltd.** Private. Reg. Dec. 15. Capital £12,000 in £1 shares. Woollen and worsted manufacturers and merchants, etc. Registered Office: Ashcroft Mills, Bramley, near Leeds 13.

**Rourafric Trading Ltd.** Private. Reg. Dec. 18. Capital £50,000 in £1 shares. Exporters, importers, merchants, factors, manufacturers and dealers in cotton, linen, woollen, worsted, rayon, silk, cashmere and union fabrics. Registered Office: Plantation House, Mincing Lane, E.C.3.

**Sydney Fashions Ltd.** Private. Reg. Dec. 22. Capital £5,000 in £1 shares. Fashion experts, designers, etc. Registered Office: 38 The Broadway, N.8.

**L.P.C. (Cards) Ltd.** Private. Reg. Dec. 22. Capital £3,000 in £1 shares. Designers, manufacturers, repairers, exporters, importers and suppliers of jacquard pattern cards. Registered Office: 34 Castle Street, Liverpool 2.

**Progress Textiles Ltd.** Private. Reg. Dec. 22. Capital £1,000 in £1 shares. Manufacturers of cotton, wool, rayon, silk, flax and linen fibres, etc. Registered Office: 14 Church Street, Manchester.

**Buxton, Ronald Du Croz and Co. Ltd.** Private. Reg. Dec. 22. Capital £60,000 in £1 shares. Brokers, factors, agents, merchants, importers, exporters and dealers in wool, wool tops, cotton, flax, hemp and jute, etc. Registered Office: Kings House, King Street, E.C.2.

**Glen-Saxe Tie Company Ltd.** Private. Reg. Dec. 24. Capital £2,500 in £1 shares. Merchanting and converting cloth into ties. Registered Office: 3 Heddon Street, Regent Street, W.1.

**Cwmni Nwyddau Cymreig (Welsh Goods Company) (Benllech) Ltd.** Private. Reg. Dec. 24. Capital £15,000 in £1 shares. Manufacturers and dealers in cloth, wool, worsted, linen, rayon, cotton, silk, tapestry, clothing and wearing apparel, etc. Registered Office: Gorllwyn, Benllech, Anglesey.

**H. J. Mayer Ltd.** Private. Reg. Dec. 22. Capital £500 in £1 shares. Spinners, weavers, hemstitchers, plaiters, pleaters, knitters, tailors, etc. Registered Office: 54 High Street, S.W.19.

**A. Parker and Co. Ltd.** Private. Reg. Jan. 1. Capital £39,000 in £1 shares. Silk, cotton, nylon, rayon and silk spinners, etc. Registered Office: Grove Works, Cemetery Road, Pudsey.

**Century Dyeworks (Elland) Ltd.** Private. Reg. Jan. 1. Capital £25,000 in £1 shares. Dyers and finishers of pieces, slubbing yarns and warps, etc. Registered Office: Century Road, Elland, Yorks.

**Lumb and Barker Ltd.** Private. Reg. Dec. 31, Capital £10,000 in £1 shares. Agents, merchants, brokers, manufacturers and dealers in wool, worsted, etc. Registered Office: 284 Swan Arcade, Bradford.

**Denys Wyatt Ltd.** Private. Reg. Dec. 17. Capital £10,000 in £1 shares. Manufacturers, importers, converters, and dealers in cloth, wool, worsted, etc. Registered Office: 81 Fountain Street, Manchester 2.

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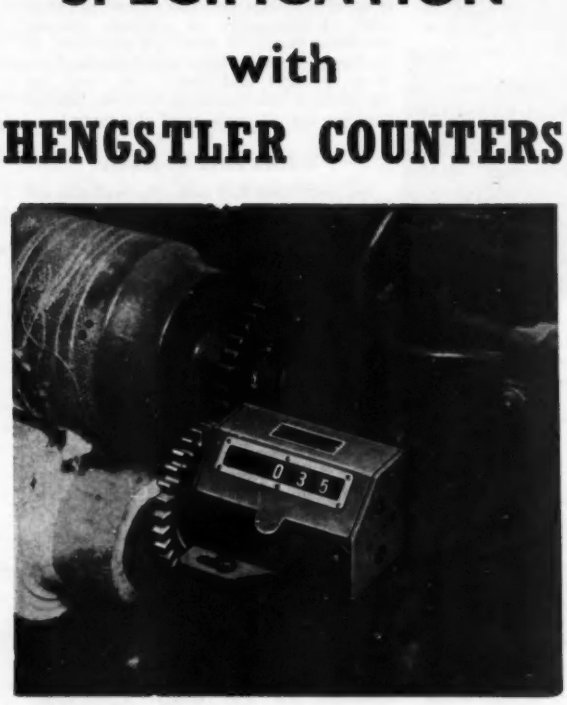


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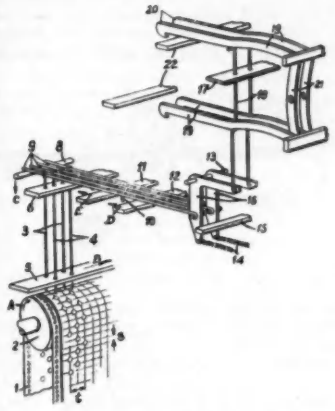
DYLAN is a registered trade mark which denotes that goods carrying the mark are made of wool or mixtures containing wool, have been treated by processes approved by Stevensons (Dyers) Limited and have passed their standards of shrink resistance. When washed in accordance with recommended procedures for wool, garments bearing the trade mark DYLAN will not felt or shrink out of fit.

# RECENT TEXTILE PATENTS

These abridgements are republished from specifications by permission of the Controller of H.M. Stationery Office. The full specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2. Price 3s. each.

**790,260 Feeler Apparatus for Dobbies**
MASCHINENFABRIK RUTI A.G., *Zurich, Switzerland.*

A feeler apparatus for looms, to control double-lift dobbies. A pattern card 1 is laid on a card cylinder 2, S designates the length of a movement step of the card, and *t* corresponds to the shaft pitch of the card. Reading needles 3, 4, are dependent from draw hooks 9, and have their feeler ends above the card in two rows. Each needle has an eye through which passes a draw hook, and proximate to, and above the card the needles pass through holes in a guide 5, and are spaced apart, according to the pitch of the cylinder, by the distances



2S and *t* respectively. The guide 5 is reciprocable in the direction of arrow B by a cam (not shown). Near their upper ends, the reading needles are passed through a second guide 6. The draw hooks are positioned above a needle lifter 8 which is reciprocable in the direction of arrow C by means of a cam (not shown) to engage and lift the draw hooks. Projecting from each draw hook is a driving nose 10, and below the draw hooks are a pick finding knife 11 and a control knife 12, reciprocable respectively in the direction of the arrows E and D by means of cams (not shown). The draw hooks are jointed, at their ends to control levers 16, rockable about a pin 13, and biassed to a stop 15 by tension springs 14. Jointed to the levers 16 are hooked needles 18, which pass through a guide 17, and on which rest the arms 19 of each of two hooks 20 of an Hattersley oscillating system 21. The hooks 20 co-operate with the dobby knives 22 which are also reciprocable.

**790,562 Warp Beaming Frames**
WILLIAM WHITELEY AND SONS LTD., *Prospect Iron Works, Lockwood, Huddersfield.*

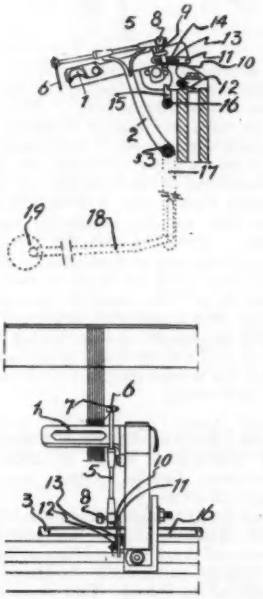
A method of beaming off warp threads from the drum of a warping frame on to a warp beam in which there is relative axial movement between the beam and the drum. The speed of rotation of the beam is varied in accordance with the relative axial disposition of the warp beam and warp drum. A variable speed mechanism is interposed in the driving mechanism for the warp beam and means are provided for adjusting the mechanism, operated by the mechanism effecting the relative movement of the warp beam and the drum.

**790,580 Machines for Pulling Cotton Plants**
SUDAN GEZIRA BOARD, *Barakat, Sudan,* and R. BOBY LTD., *St. Andrew's Works, Bury St. Edmunds, Suffolk.*

A machine for pulling cotton plants out of the ground comprises a pair of endless moving belts, lengths of which are pressed together and inclined in relation to the ground so that they rise in the direction from front to rear of the machine. A pair of driven pneumatic tyred wheels roll against each other in the vicinity of the nip of the belts, these wheels being inclined at approximately the same angle as the belts, for imparting a strong initial upward pull to the plants.

**790,643 Weft Stop-Motion Device**
M. D. DURAN, 35 *rue San Olegario, Sabadell, Barcelona, Spain.*

A weft stop-motion device for looms. The device, mounted adjacent the temple 1, comprises a support 2 secured to a shaft 3 on which is mounted a shaft 5. The end



of shaft 5 carries a pin 6, while the opposite end of the shaft has a weight 8 and an arm 9 provided with a stop 10. A part 11 subjected to the action of a spring 12, is pivoted to the support of the temple, and is provided with another stop 13 which may be moved to different positions in a slot 14. While the loom is operating normally, part 11 rests against a catch 15 which is secured to a bar 16 by which the loom is stopped. While the weft is being inserted, pin 6 is surrounded by the weft 7 and the pull exerted tilts the needle, the shaft 5 remaining in such a position that, when the support 2 rocks about shaft 3 actuated by lever 17 (displaced by the connecting-rod 18 pivoted eccentrically of the disc 19 controlled by the mechanism of the loom), the stop 10 does not strike against stop 13 so that the latter remains inoperative. When due to breakage of the weft thread the pull exerted on pin 6 ceases, the shaft 5 is forced to rotate by the action of weight 8, and the stop 10 assumes the position in which it strikes against stop 13 when the support 2 rotates. This slightly rotates the part 11 in counteraction to spring 12 so that it releases the catch 15, and the automatic stopping gear of the loom is at once rendered operative.

**790,814 Feeding Cores to Winding Spindle**
OFFICINA MECCANICA BRUEGGER S.P.A., 27, *Via Borsieri, Como, Italy.*

Apparatus for feeding cores to a winding spindle in a cop winding machine comprises a magazine for receiving the cores and having means for feeding them one at a time to a receiver. The receiver serves to convey each core, in turn, to a supporting device which presents the core to the winding spindle. The supporting device is provided with magnetic means for retaining the core, by attraction of a magnetisable element secured to the core.

**790,820 Continuous Treatment with an Acid Chlorite Bleaching Bath**
SPINNFASER AKTIENGESELLSCHAFT, *Kassel-Betterhausen, Germany.*

It has been found that continuous bleaching of a fibre fleece with an acid chlorite bleaching bath having a pH value in the region of 4 can also be carried out at elevated temperature, if an open weave fabric consisting of glass fibres is used for conveying the material to be bleached. This fabric is completely resistant to the acid chlorite bleaching bath, even at the elevated temperature, and has the advantage that, while having high mechanical tensile strength, it does not show any fatigue phenomena under bending stresses.

**790,849 Drawframe, etc., Stop-Motion**
WILLIAM EWART AND SON LTD., 17 *Bedford Street, Belfast.*

Stop motion actuating mechanism for drawing, roving or the like frame, comprises a member mounted so as to extend across and below a sliver passing through the frame and to rotate under the action of

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RINGS AND
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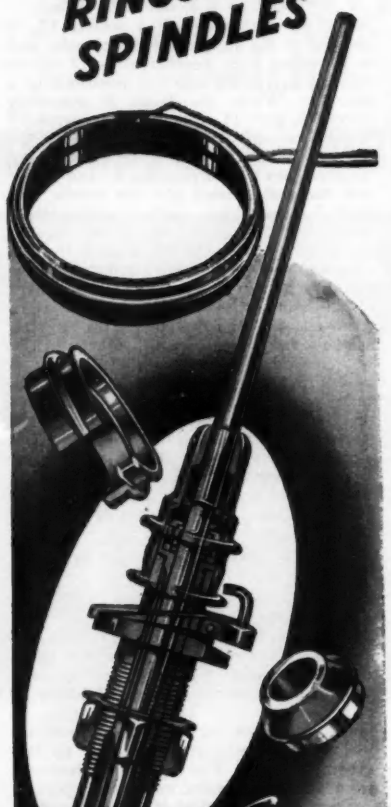

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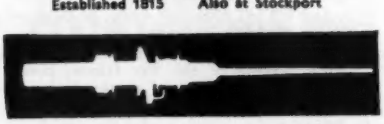

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a sliver contacting and being drawn across it when the sliver breaks, and to roll, when so rotated, from a position in which the stop motion is inoperative to a position in which operation of the stop motion is initiated.

### 790,858 Preventing "Lashing-in" on Automatic Looms

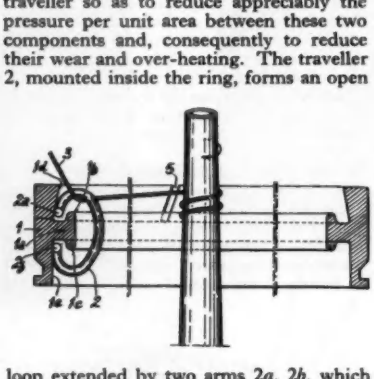
BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION, *Shirley Institute, Didsbury, Manchester* 20.

An automatic pirn-changing loom having a rotary magazine has means for removing the new weft trail from the danger zone of possible "lashing-in," which comprises a suction nozzle located adjacent the notched disc of the magazine and in such position that each new weft trail, as it is formed by the first pick, lies across the mouth of the nozzle. The thread may be tensioned by the suction and subsequently partly inducted, so that its end is sucked into the nozzle when severed by the temple cutter or freed from its anchorage, and either wound on to its anchorage or wholly inducted when the second end is freed.

### 791,023 Ring with Inside Traveller

P. LEMAIRE, 51 *rue de Lille, Wambrechies (Nord), France* and P. DERREUMAUX.

A new ring and traveller device giving a large surface of contact between ring and traveller so as to reduce appreciably the pressure per unit area between these two components and, consequently to reduce their wear and over-heating. The traveller 2, mounted inside the ring, forms an open



loop extended by two arms 2*a*, 2*b*, which possess a curvature corresponding to that of the inside wall of ring 1. The ring is formed with an internal T-section rib 1*a* on which the traveller is frictionally maintained by its arms. In order to facilitate the threading of the traveller the ring 4 is provided with a slot 5 in its upper part. When the spindle begins to turn, the thread 3 draws the traveller towards the centre of the ring so that arms 2*a*, 2*b*, come into contact with the inner surfaces 1*b*, 1*c* of the rib 1*a*. The traveller slides on these surfaces as it rotates until its speed is high enough for its arms to lose contact with the rib and to be thrown by centrifugal force against the surfaces 1*d* and 1*e* of the inside walls of the ring.

### 791,074 Uniting Edges of Fabrics

JUTE INDUSTRIES LTD., *Meadow Place Buildings, Dundee, Angus*, and J. S. PLENDERLEATH.

A method of uniting the edges of woven fabrics without substantial increase of thickness of the resultant fabric at the seam, and without appreciable reduction in the strength of the fabric. Two strips of non-thermoplastic woven fabrics are united at adjacent overlapping edges, the strips having thermoplastic bonding material in thread or strip form woven into their overlapped edges instead of non-thermoplastic warp threads, the material bonding the edges together.

### 791,084 Supporting Wide Beams in Processing

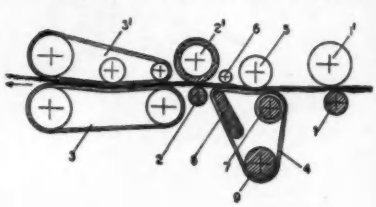
GEBRUDER SUCKER, G.m.b.H., *Blumenbergerstrasse*, 143-145, *M. Gladbach/Rheinland, Germany*.

Device for supporting beams on which warp or cloth is wound. The device includes driven stub shafts, and a connecting device between at least one stub shaft and its drive is adapted to provide at least one degree of freedom of motion of this stub shaft in relation to its drive. It is desirable to arrange the connecting device so that in the event of an axial free movement of the stub shaft a rotational driving connection is maintained between the stub shaft and its drive.

### 791,116 High Draft Drawing for Slivers

C. SCHLEIFER, *Via Domenichino* 1, *Milan, Italy*.

Describes a high draft drawing unit for slivers. The sliver is introduced by a pair of feed rollers 1, 1′ and drawing is performed between these rollers and the rollers 2, 2′. The sliver is then withdrawn by the usual leathers system 3, 3′ and fed to other rollers (not shown) for further processing. A gripping device for guiding



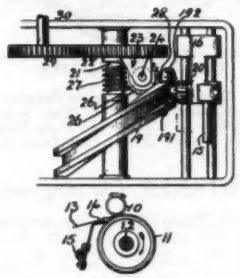
the fibres is provided between the feed rollers and the drawing rollers, and comprises a belt 4, one or more pressure rollers 5 and one or more guide rollers 6. Belt 4 is driven by a roller 7 and led around a reversing bar 8 and a tensioning roller 9. In order to exert forces over a long path of the sliver, the roller 5 is arranged forward of the roller 7. Roller 7 has collars so that the belt is yieldable between these collars. A forward point for gripping the sliver is provided by the bar 8 which co-operates with the roller 6 and is located close to the drawing rollers so that practically all of the fibres of the sliver at guided and controlled.

### 791,137 Traverse Motion on Twisting, etc., Machines

T.M.M. (RESEARCH) LTD., *Hartford Works, Oldham*.

A cam-operated traverse mechanism has improved means whereby a secondary periodic acceleration and deceleration may be imposed upon the primary rotary motion. Spools or bobbins 10 are supported for frictional contact with rollers 11 driven by a common shaft 12. The cross-winding of the threads 13 is effected by thread-guides 14 which are mounted upon a common traverse-rod 15 to which a reciprocatory motion is imparted. The mechanism by which the traverse motion is imparted to the rod 15 comprises a cam 19 having a groove 191 which co-operates with a cam-follower 20 mounted on slidable bracket 16. The cam is mounted for free rotation on a stationary shaft 21 on which is also mounted a freely rotatable gear 22.

The gear 22 carries in brackets 23, a short shaft 24 on which are fixed a worm-wheel 25 and a swashplate 26, the worm-wheel being in constant mesh with a worm 27. Mounted on the periphery of the cam is a tee-shaped driving member 28, the shank of the tee fitting in a socket provided in an off-set part 192 of the cam. The cross-bar of the tee-member is received in the groove

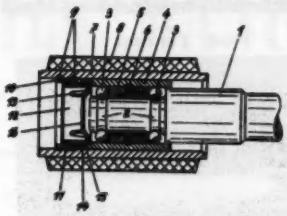


of the swash-plate, and the arrangement is such that movement of the wheel 22 is imparted to the cam through the medium of the tee-member which constitutes a driving connection for the cam. The worm-wheel is rotated bodily about the worm 27, and is simultaneously rotated about its own axis, thus rotating the swash-plate 26 and operating to impart to the cam through the tee-member a periodic acceleration and deceleration at each revolution of the swash-plate about its own axis. The spur-gear 22 is driven by a pinion 29 on a driving-shaft 30.

### 791,145 Top Weighting Rollers in Drafting Mechanisms

SKF KUGELLAGERFABRIKEN GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, 13 *Ernst Sachs Strasse, Schweinfurt am Main, Germany.*

Improvements in top weighting rollers for drafting machines. The roller shaft 1 is provided with grooves 2 for the balls 3 of the bearing and with an outer race ring 4. The latter is positioned by an intermediate member 5 which is connected with the ring 4 by a spring ring 6. A sleeve 7 is a close sliding fit on the ring 4, and is provided with a cot 8. Near the outer end of sleeve 7 are two internal grooves 9, each of which receives a spring ring 10, and between these rings there is located a flange 11 on a resilient coupling member 12. The latter is also provided with axial slits 13 to increase the resilience. At the edge adjacent to the slits, the member 12 is formed with a bead 14 which, when the sleeve 7 and the ring 4 are coupled together,



engages a groove 15 in the ring 4. A protective cover 16 is sprung into position between the member 12 and the shaft 1 to keep out fly and dirt.

### 791,233 Warp Tension in Sizing

J. M. GREEN, *Acrefield, Whalley, nr. Blackburn.*

Tensioning device for use on a creel or a loom includes a pair of operably friction surfaces, one of which is movable relative to the other. Means are provided for controlling the proximity of the two surfaces and therefore increasing or decreasing the grip applied to a beam spindle or ruffle gripped between them and thus the tension applied to the yarn. Means for releasing the grip comprises a lever attached directly to a carrier for the movable friction surface and forming part of the means for controlling the proximity of the two surfaces. The lever is adapted quickly, to disengage the movable surface from the ruffle, and to "snap" the movable surface into a gripping position when desired.

### 791,290 Sliver Coiling in Ball and Bank Feed

G. P. WILBY, *Denby House, Denby Dale, nr. Huddersfield.*

A sliver winding machine on which sliver is wound on to bobbins, is provided with an endless flexible member adapted to support bobbins spaced apart along its length, and to carry the bobbins successively to the winding position on the machine. Preferably there are two parallel flexible members, passing over wheels, one pair of which are located at the winding position on the machine, and the other pair some distance from it.

### 791,472 Automatic Card Stripping

S. SUZUKI, 24 *Yasukura-Aza-Nishifuruno, Takarazuka City, Hyogo, Japan.*

Automatic stripping apparatus for carding engines comprises stripping means provided with a suction opening elongated in the circumferential direction of the cylinder or doffer. Through this opening suction is applied to draw out the fibres without damage through the spaces between the wire needles on the cylinder or doffer, so that the fibres may be returned for re-introduction into the lap. A traversing member for the stripping means is movable parallel to the axes of the cylinder and doffer. In a preferred construction the stripping means are in the form of a suction nozzle mounted on the traversing member.

### 791,797 Air-Permeable Flock-Coated Fabrics

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A process for the production of a flock-coated fabric having air permeability, in which the fabric is produced from a carrier fabric having high elasticity in the longitudinal and/or transverse direction. It is strongly stretched in the longitudinal and/or transverse direction to produce tears in the adhesive layer binding the flock material to the carrier fabric, so that the air-permeability possessed by the fabric in the uncoated state is restored without affecting the bond between the flock material and the carier fabric.

### 792,126 Spring Loaded Drafting Mechanism

SACO-LOWELL SHOPS, 60 *Batterymarch Street, Boston, Massachusetts, U.S.A.*

Describes a drafting mechanism having a number of pairs of top and bottom rolls positioned to act successively on a sliver, with a supporting member overlying the top and bottom rolls. A first arm is supported for pivotal movement in a vertical plane and engaging one of the top rolls, and a second arm is supported on the first arm for pivotal movement in a vertical plane and engaging another of the top rolls. Coil spring loading means are interposed between the second arm and the member for pressing the top rolls engaged by the arms on to their respective bottom rolls. Means are provided for correcting side force producing errors of the spring loading.


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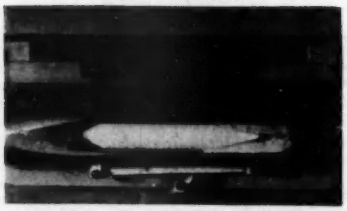

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# THE TEXTILE MANUFACTURER

No. 1011. Vol. 85 Two Shillings and Sixpence March, 1959


# *Notes of the Month*

## EDUCATION FOR CAREERS IN TEXTILES

"EDUCATION for Careers in Textiles" is now a standard publication of the Textile Institute and the only one of its kind issued in Britain. The sixty-one pages of this year's publication review in some detail the various scholarships and awards which are obtainable in the textile industry, as well as an outline of the Institute's Associateship Examinations. Subjects in which instruction is given at universities and colleges are listed in comprehensive fashion and it is quite clear that this publication is of enormous value and interest to any would-be entrant into the industry.

In an explanatory note the Institute notes that the book is provided "to present the student contemplating the textile industry as a possible career, and those who advise him, with the information they require." The comprehensive account of the opportunities which exist in the British Isles for acquiring the education and background demanded by a career in textiles may well surprise many people. Information is grouped under three main headings: subjects in which instruction is given: courses available: college details. Within these groups subject matter is arranged alphabetically and cross references made where necessary.

## MANUFACTURING "ORLON" IN HOLLAND

A NEW multi-million-dollar plant to manufacture "Orlon" acrylic fibres is to be built by the Du Pont Company at Dordrecht, the Netherlands. The plant, to be operated by a Du Pont subsidiary that will be formed shortly in the Netherlands, will produce "Orlon" staple and tow mainly for customers in Europe, including the U.K. It will have a capacity of approximately 15,000,000 lbs. a year. Mr. A. H. Geil will be transferred from Wilmington, Delaware, to be managing director of the new company. Construction work will begin later this year, and start-up of operations is scheduled for the last quarter of 1961. The peak construction force will be about 900 persons, and operation of the plant will provide new jobs for about 400 men and women. With the exception of a number of supervisory and technical personnel, all hiring for both construction and operations will be done in the Netherlands. The 40-acre plant site is located in the oldest city in South Holland, about 12 miles from Rotterdam. This plant is the third new manufacturing facility in Europe announced by the company. A paint plant is being built in Malines, Belgium, and construction of a neoprene synthetic rubber plant near Londonderry, Northern Ireland, is well under way with operations due to start in 1960. Du Pont has manufacturing subsidiaries in Argentina, Brazil, Canada, Chile, Cuba, Mexico, and Venezuela.

"We are building our first man-made textile fibres plant in the Common Market area to fill the fast-growing needs of all Europe," said Mr. Geil. "The European economic community is the largest single market outside of the U.S., and this new plant emphasises our faith in the future economic progress of this important area. "It will be our continuing effort to be a good corporate citizen in the Netherlands, as it has been in the nine other countries in which we have facilities. In each country, it is our aim to employ and train residents of that country who can eventually fill the important positions in management."

"Orlon," Du Pont's acrylic fibre, is used in sweaters, knitted dresses, and skirts, a great variety of woven fabrics for men's, women's, and children's wear, blankets, socks, underwear, hand knitting yarns, and deep pile fabrics.

## HOME MARKET PROMOTION FOR BRITISH WOOL TEXTILES

A SCHEME to spend between £250,000 and £300,000 per year on publicising the products of the British wool textile industry in the home market has been laid before the industry by Sir Walter Ward, chairman of the Wool Textile Delegation, a body which incorporates trade federations in the industry. At a recent meeting in Bradford, the project was laid before some 200 representatives of these trade federations, who are to consult their members on the desirability of the scheme and on proposals for financing it by a statutory levy on the industry. As at present envisaged, this home promotion scheme for British wool textiles would operate for an initial period of at least three years. Policy control would be in the hands of the delegation, acting through a Wool Textile Promotion Council set up for the purpose, but the execution of the scheme would be the responsibility of the International Wool Secretariat, which has agreed to co-operate in consumer publicity. Outlining the scheme to the Bradford meeting, Sir Walter said that association with the I.W.S. in this venture would offer substantial advantages, including the services of trained staff and advertising agencies already familiar with wool textile problems. The I.W.S. had long experience of similar joint campaigns in the U.K. and elsewhere and had established excellent relations with the Press. In addition, the I.W.S. might make financial contribution towards the cost of the joint campaign and it would be represented on the Promotion Council.

On the need for the scheme, Sir Walter said there was ground for concern that Britain's expenditure on clothing since the war lagged considerably behind expenditure on other consumer goods, and the trend persisted. From 1948 to 1957, U.K. expenditure on men's and women's wear increased by 53%, but for motor-cars and motor-cycles it increased by 656%, for furniture and floor coverings by 229%, and for radio, television, electrical and miscellaneous durable goods by 137%. Britain's hire

purchase debt of some £600 millions was inevitably mortgaging future consumer purchasing power to the detriment of clothing, the sales of which were not as yet to any great extent organised on a credit basis. It was no longer the case, said Sir Walter, that the men of this country could be regarded as the best-dressed in the world. There was an increasing tendency towards casualness and making-do as long as possible. Britain's expenditure on clothing, as a percentage of total expenditure, was—with the exception of Belgium—the lowest in Europe. This was probably due to the fact that incomes in the U.K. were higher but it emphasised the point that people were spending additional income on goods other than clothing. Sir Walter said it was not mere co-incidence that two sections of the British wool textile industry which had maintained a high level of activity during the past year—carpets and hosiery—were sections operating promotional schemes.

## EXPORTS OF WOOL TEXTILES TO U.S.S.R.

ACCORDING to a recent announcement from the National Wool Textile Export Corporation, exports of British wool textiles to Russia have been increasing in recent years, and the table below certainly illustrates this:—

EXPORTS OF WOOL CLOTH TO RUSSIA

| | *Sq. Yds.* | *£'s Sterling Value* |
|---|---|---|
| 1954 .. | 1,161 | 1,582 |
| 1955 .. | 59,075 | 45,009 |
| 1956 .. | 373,523 | 295,624 |
| 1957 .. | 822,971 | 726,280 |

This trade, the Corporation point out, could undoubtedly be extended with the help of H.M. Government, and several deputations from the British wool textile industry to the President and Minister of State at the Board of Trade have expressed the industry's interest in the Russian market. When Messrs. Kruschev and Bulganin visited Britain in 1956, wool cloth was on the list of goods they were interested in importing into the U.S.S.R., and, as there has never been any suggestion that wool textiles should be added to the list of "strategic" exports, there would appear to be good prospects for their sale in Russia if trading conditions were easier. As it is, the trade is subject to difficulties. Russian trade is regulated on a state basis and any country trading with the U.S.S.R. would be placed at a disadvantage if it left the trade to its own devices. The British government, therefore, is obliged to take a much greater part in Anglo-Russian trade than it does in trade with many other countries, which, apart from import duties, is left free of Government intervention.

The U.S.S.R. has been anxious to acquire certain essential goods from the Sterling Area which are not available in sufficient quantity within Russian territory itself. These commodities include rubber and raw wool. The U.K., in turn, has been willing to obtain certain essential items from Russia, such as timber. In the matter of trade such as this, in essential, non-strategic items, trade between the two countries is straightforward enough. If Britain acquires timber which she needs and cannot produce herself, she is quite willing to pay sterling for it and to allow Russia to use that sterling how and where she wishes.

In the case of consumer goods and non-essential commodities, however, the British government will not allow imports into Britain from Russia except under licence. Should the Russian authorities ask that licences should be given to import such non-essentials into Britain, the British government agrees to grant them on the understanding that Russia, in turn, agrees to place orders to a similar value for British-made goods of the same non-essential character. It is as a result of agreements such as these that wool cloth has been exported to Russia in recent years. In return for the sale of British wool cloth in Russia, Britain has imported an equal value of, among other items, crabmeat, matches and plywood. In addition to this kind of trade, there have also been considerable straight barter deals between the U.S.S.R. and the Scottish C.W.S., by which Russia exchanges grain for wool cloth.

## CANADIAN TEXTILE INDUSTRY

FULL appreciation of the value of the domestic cotton textile industry to the Canadian economy is shown in the current report of the Tariff Board. Mr. H. R. Crabtree, retiring president of the Cotton Institute of Canada, told members at the annual meeting that the Board paid tribute to the economic and social importance of the industry, and to its efficiency. He added that there was also keen awareness "of the unfortunate fact that one-half of the Canadian fabric market is supplied by foreign producers, and that there is a steady decrease in employment and share of the domestic market held by Canadian mills."

Mr. Crabtree thanked the Canadian Government for the interest it had shown during the past year in the affairs of the industry. He mentioned specifically amendments made to the Canadian Customs Act last July to "tighten our anti-dumping laws," and the Tariff Board review. "We hope that the full strength of the new customs regulations will soon be vigorously applied against all imports," he continued. He described the Tariff Board review as "the most thorough scrutiny by an independent body in the history of the industry," adding that "after 48 days of sittings during which the Board heard many words of testimony and examined hundreds of documents there emerged intact the salient facts that the industry had stated about itself."

With about 19,000 people working in 50 mills, the industry is still a large employer of labour despite recent reductions; it is important to such centres as Drummondville, Valleyfield and Cornwall, and vital to such others as Montmorency, Yarmouth and Magog. Mr. Crabtree, who is president of The Wabasso Cotton Co. Ltd., Three Rivers, said that the Board reported that the industry was "bedevilled by two factors above all others," the necessity to produce a wide variety of goods for a relatively small home market, and the nearness of the big U.S. industry. The Board also reported that while the U.S. was the largest supplier of cotton textile imports into Canada, "plain uncoloured fabrics enter from India under the British Preferential Tariff, fabrics of very fine construction enter duty-free from the U.K., and in certain lines competition from Japan is increasing."

Mr. Crabtree noted that tariff protection for the Canadian cotton textile industry has been progressively reduced during a period when import pressures were increasing. The present apparent temporary improvement in the financial position of the industry was due to the temporary export sale policy of raw cotton by the U.S. which allows cheaper sale for export than for home use, he said. "It is regrettable that the Tariff Board, while agreeing so much with the industry's case, suggests relatively little help . . . very little assistance is proposed even on bleached and coloured fabrics where the Board suggests duty rates of 22½% instead of 20% when coming from Most-Favoured-Nation countries, which includes the U.S. In addition the Board refused to take any position on the special problem of the growing volume of imports from such low-wage Asiatic countries as Japan and India. It was hoped . . . to stimulate among Government policy-makers awareness of this gathering cloud from the East."

# Oil Burners for Mill Boiler Plant—3

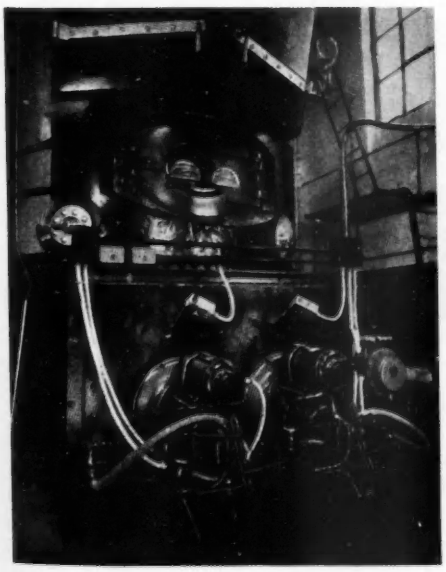
*Operating features and capacities of different types of rotary burners, efficiency performances, and details of oil control including flow, pumping, pressure and discharge, also primary and secondary air requirements*

By F. H. SLADE, A.M.I.MECH.E.

ADVANTAGES claimed for rotary oil burners are simplicity in construction and the ability to handle, without choking, unfiltered oils and industrial residues. They are of the low-pressure air type and their design is based upon the distribution of oil over the air blast from the lip of a rapidly rotating cup; an operating principle ensuring even separation of oil particles and initiating atomisation. Rotation of the cup may be by either a small air or steam turbine, a direct-coupled electric motor, or through belting from an electric motor. Primary air, usually 15 to 20% of that required for combustion, is introduced at a pressure of 4 to 10 ins. w.g. through an air nozzle around the cup, this arrangement serving to prevent drops of oil being thrown off in the plane in which the end of the cups lie. Some manufacturers also fit guide vanes in this nozzle; to straighten out any rotation of the atomising air, or to give it a rotation in the opposite direction of the cup.

Fig. 18 shows burners of this type firing a Cochran No. 19 boiler, the performance figures for which over a seven weeks' period were 723,940 lbs. of steam for a consumption of 5,787 gallons of fuel oil. The makers are Hydran Products Ltd., a concern producing rotary burners in four sizes to cover an output range of 133,000 to 6,715,000 BTUs per hour. These are the "Minor," "Standards," "Major" and "Magna" models. The former, the smallest in the range, is a belt-driven unit, operating at a shaft speed of 4,000 r.p.m. and with the fan delivering 20 cu. ft. of air per minute at a pressure of 3 ins. w.g. Its oil consumption is ¾ to 4 galls. per hour for an output of 133,000 to 707,000 BTUs per hour on 45 secs. Redwood No. 1 (gross).

The other three models are of two types; compact or belt drive. In the compact type the electric motor is completely built into the unit, with the oil feeding to the burner through the motor shaft, whilst in the belt-driven type, as shown in Fig. 19, the electric motor is mounted above the remainder of the unit. Advantages of the latter arrangement are that the motor may be replaced without disturbing the rest of the unit and it makes possible an increase in the firing rate above standard should the required heating load increase. In other respects the two types are similar. The base of each unit is a cast iron tray, and the driving motors are of ½ h.p. rated for continuous duty and normally running at 2,850 r.p.m. (⅓ h.p. motors are used in the case of the Minor burners and



(left)
**Fig. 18 Boiler fired by Hydra Major burners. The average evaporation rate for a test period of seven weeks was 13·05 lbs. of steam per lb. of fuel oil**

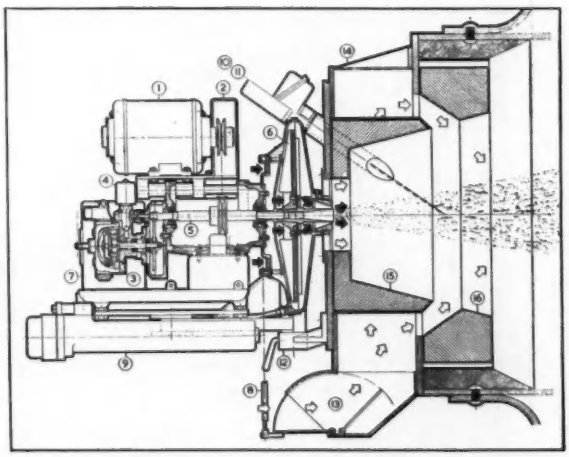


**Fig. 19. Typical burner application. Primary air supply is indicated by the black arrows and secondary air by the arrows shown in outline**

1 h.p. for certain increased capacity machines).

Referring to Fig. 19, it will be seen that the main burner, components and ancillaries comprise (1) burner motor, (2) drive case, (3) metering pump, (4) solenoid valve, (5) oil feed to rotary cup, (6) primary air fan, (7) modulating motor for oil primary and secondary air control, (9) heater, and (12) swivel stand. In the case of most boiler conversions all that is necessary is the provision of an oil firing front plate and a suitable refractory lined combustion chamber within the boiler, the latter being designed to give pre-heating to the secondary air. The front plate is, as shown, cut to provide an opening for the burner and to allow access for ignition purposes; providing also a combined inspection and relief door and a secondary air inlet door with a controllable secondary air damper. The main parts here are thus (8) secondary air control, (10) electric-gas ignition, (11) photo-electronic flame failure, (13) secondary air inlet with adjustable damper and adjustable director plate, (14) secondary air distribution cowl, (15) flame development tube and (16) insulating ring.

### Operation

In operation fuel oil is passed through the centre shaft of the burner (5) to a rotary cup atomiser, where centrifugal force spins it on to the outer edge of the cup until it reaches the rim, where it is thrown off tangentially at high speed. Around the periphery of the cup is a fixed nose, and through the annulus so provided, primary air is passed by the integral fan (6). This air coming into contact with the oil spinning from the rotary cup atomises it completely, whilst to ensure satisfactory atomisation, the primary air is made to rotate in the opposite direction to the rotary cup. A simple movement of a control lever increases or decreases the flow of oil to the rotary cup and thus varies the heating capacity of the burner. Furthermore, the most efficient shape of flame for a given combustion chamber is arranged by installing the appropriate shape of burner cup and nose.

The single lever control regulating the flow of oil to the burner cup operates in conjunction with the metering mechanism. It may be positioned manually or automatically and, through direct linkage to both primary and secondary air valves, maintains the current fuel oil/air ratio through the turn down range of the

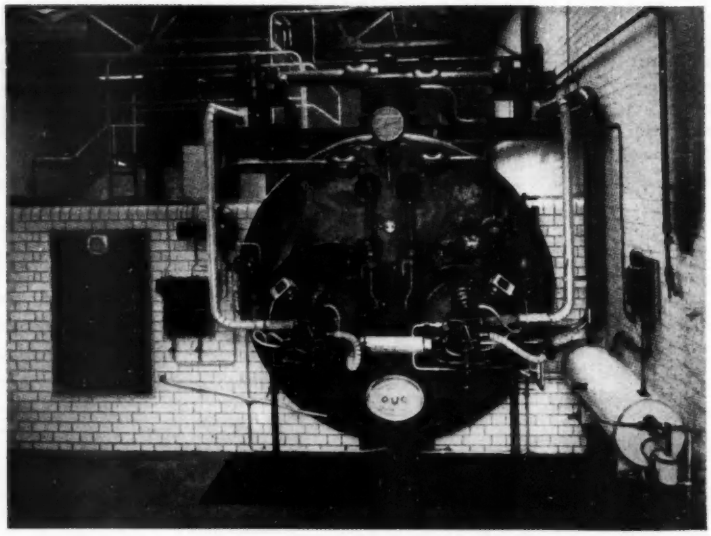
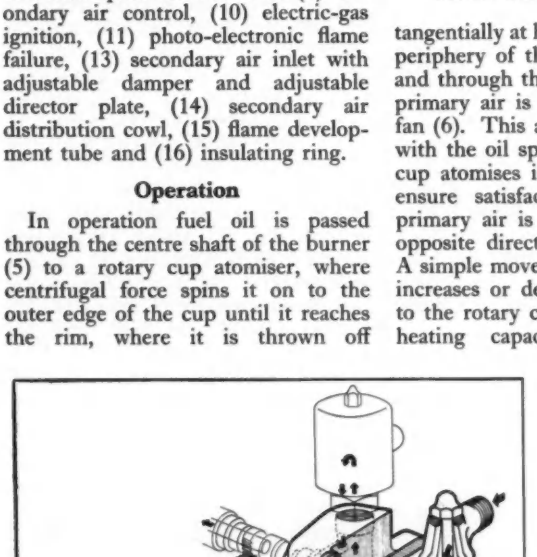


Fig. 21. Lancashire boiler 26 ft. 6 ins. long by 7 ft. 0 ins. dia., fired by two Hydra Magna boilers. Overall efficiencies of 78·8% and 82% were recorded on initial and final runs



(above)
Fig. 22. Close up of one of the burners fitted to the boiler shown in Fig. 21, showing the rotary cap. These units are equipped with a separate blower to handle the large volume of primary air required

Fig. 20. Cut away view showing the metering mechanism and built in circulating pump. The latter is fitted when it is necessary to circulate the hot oil through the ring main system continuously

Table 1

| | Initial Run | Final Run |
|---|---|---|
| Duration of test (hrs.) | 3·15 | 5·13 |
| Oil consumption—gal. at 60°F. | 79·7 | 128·5 |
| —gal./hr. | 25·3 | 25·1 |
| Water evaporated (lb. actual) | 10·900 | 18·200 |
| Steam pressure p.s.i.g. | 68 | 72·3 |
| Water temperature entering Economiser °F. | 183 | 172 |
| Water temperature leaving Economiser °F. | 227 | 211 |
| Mean % $CO_2$ at end of combustion chamber | 10·8 | 14·0 |
| Mean % $CO_2$ and gas temperature °F. at end of side flues | 8·95 | 12·35 |
| | 525 | 535 |
| Mean % $CO_2$ and gas temperature °F. at economiser outlet | 8·0 | 11·1 |
| | 379 | 345 |
| Evaporation factor (dryness faction 0·985) | 1·05 | 1·06 |
| 1 lb. Water/lb. oil, f. and a. 212°F. | 15·2 | 15·8 |
| Evaporation f. and a. 212°F. lbs./hr. | 3,640 | 3,750 |
| Overall efficiency % | 78·8 | 82·0 |
| Stack loss % | 18·2 | 14·1 |
| Radiation and unaccounted losses % | 3·0 | 3·9 |
| Per cent. of heat in fuel recovered by economiser (included in overall efficiency figure above) | 4·0 | 4·3 |

burner. The metering pump meters by volume and gives precision control of flow irrespective of the fuel grade. It is, as shown in Fig. 20, of the valveless, rotary vane type and is driven by a steel pinion and fibroid gear from the main burner shaft.

Oil normally flows by gravity to the pump, the regulating mechanism of which comprises a ball-bearing cam device which varies the eccentricity of the rotor blades to the pump case, thereby altering the effective volume available and controlling exactly the amount of oil fed to the burner. The complete mechanism is submerged in a built-in oil reservoir and is therefore provided with an ample head of oil at all times. Provision is also made to fit electric heaters, thermostatically controlled in this reservoir so as to provide hot oil for trouble-free ignition after prolonged periods of shut-down. Where the heavier grades of oil are used, oil pre-heating is, of course, essential. It is also recommended that resort is had to a circulating system, using, as illustrated in Fig. 20, a combined metering and circulating system for the smaller installation and an independent circulating pump serving a ring main when a number of burners are installed.

In the former case, the circulating pump is direct-coupled with the main drive and metering pump at (1) and embodies (2) body heating elements, (3) control thermostat, (4) dial thermometer, (5) release valve and (6) conduit terminal box. Thus fitted the flow of oil is through the suction inlet (A) and thence through the circulating pump (B) into the metering pump at (C). It then flows from the metering pump back to the burner via the solenoid valve at (D).

The Standard and Major models have output ranges of 265,000 to 884,000 BTUs per hour and 707,000 to 2,828,000 BTUs per hour on 200 secs. Redwood No. 1 respectively; for a fuel consumption of $1\frac{1}{2}$ - 5 galls. and 4 to 16 galls. of fuel oil per hour. In the case of the Major models fuel oils up to 950 secs. generally may be used and in special circumstances 3,500 secs. oil. The primary air supply in the Minor, Standard and Major models is, as indicated, developed by an integral fan encased in the cast iron front castings. The Magna model is not, however, so equipped. In view of the larger volume of primary air required, calling for a larger diameter fan, it is fitted with a separate blower.

## Lancashire Boilers

Fig. 21 illustrates two Hydra Magna burners firing a Lancashire boiler, whilst in Fig. 22 is given a close-up view of one of these units. It is belt-driven by a $\frac{1}{2}$ h.p. motor running at 2,850 r.p.m. and the primary air is supplied by a blower having a capacity of 200 c.f.m. at 16 ins. w.g. and driven by a 2 h.p. 2,850 r.p.m. motor. The fuel consumption is 15 - 48 galls per hour for a heat output of 2,651,000 - 8,477,000 BTUs per hour on 200 secs. Redwood No. 1 (gross) oil at 100°F. (calorific value 18,900). The burner is also suitable for fuel oils up to 3,500 secs.

Tests were carried out on the installation illustrated in Fig. 20; to determine boiler efficiency and to obtain improvements, if possible. This involved an initial run and trial to

Fig. 23. Front view of the Hamworth oil burner, of the horizontal rotary cup type, it is made in eleven sizes, having normal outputs of 6·25 to 146 galls. per hr.

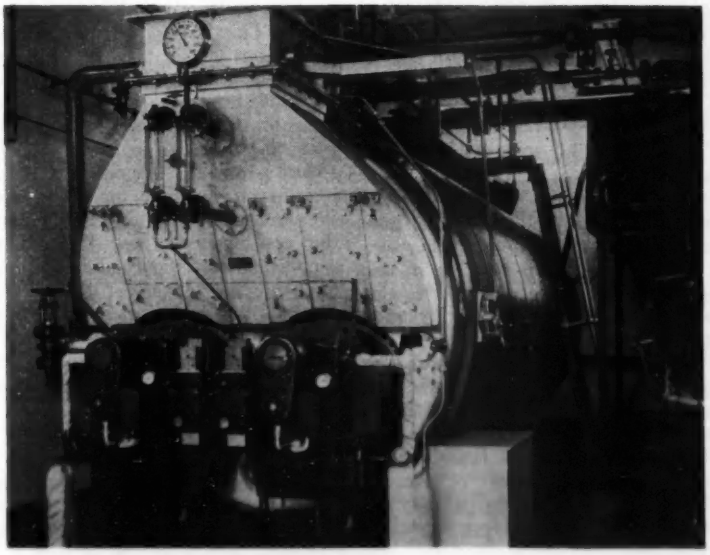


Fig. 24. Typical installation showing two Hamworth burners on an Economic boiler